

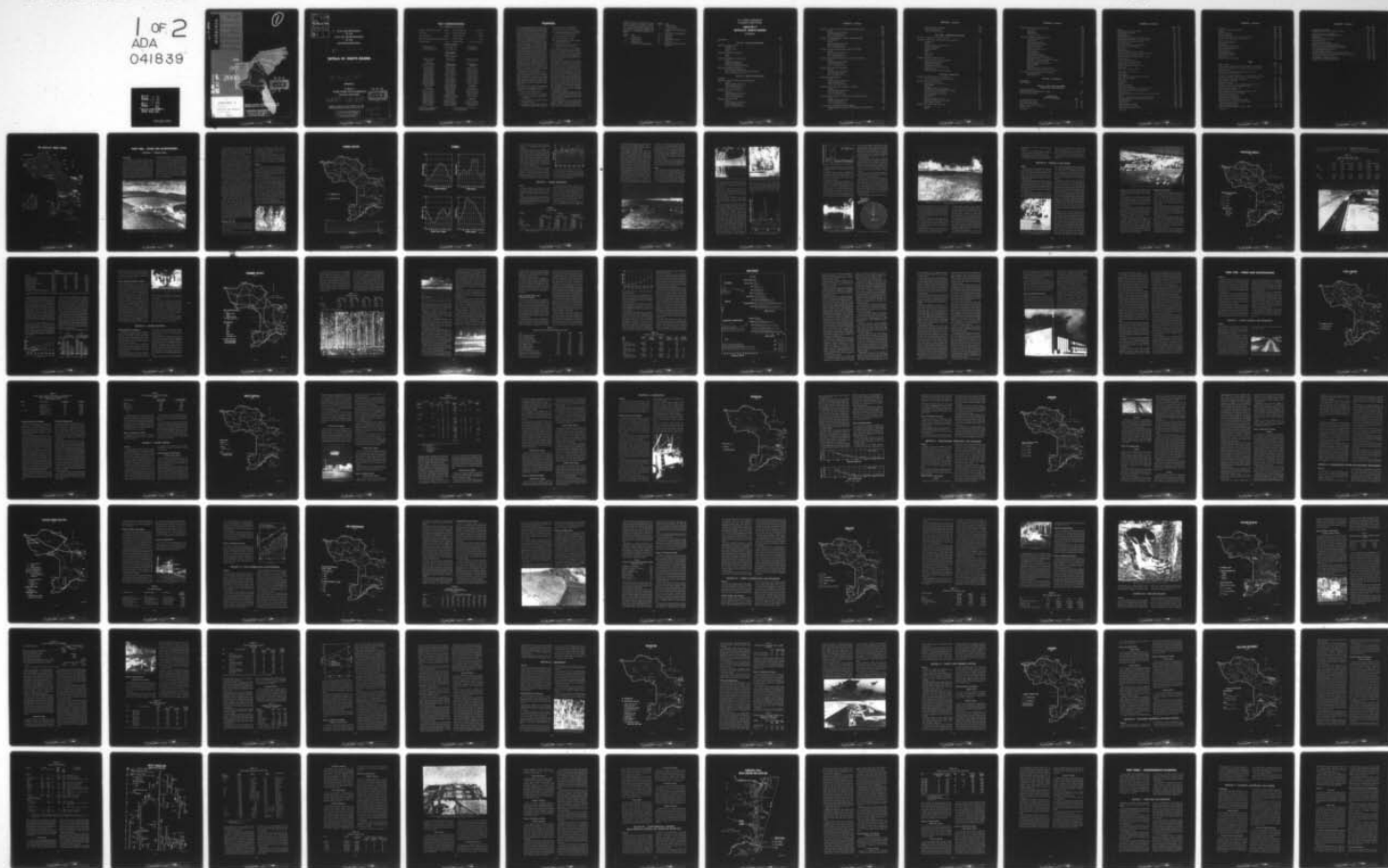
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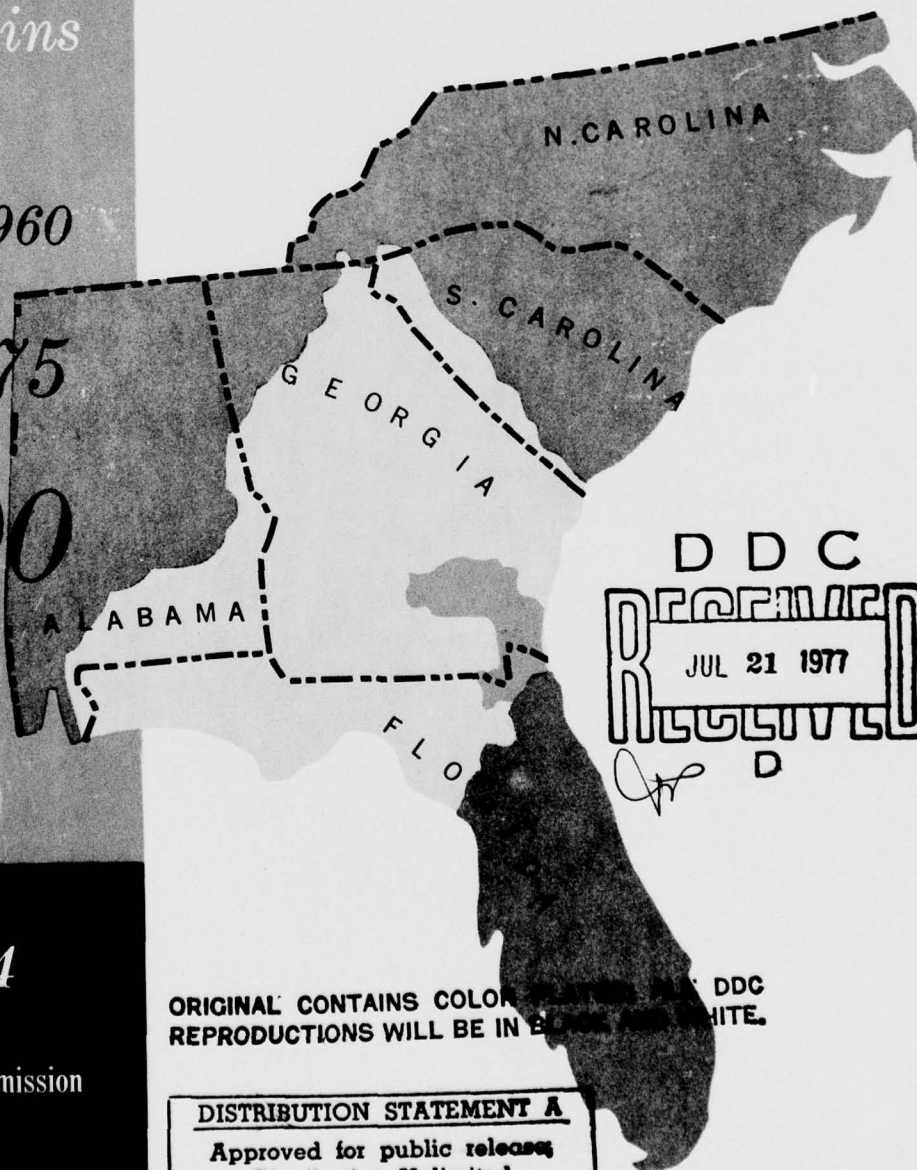
SATILLA
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To report of...

United States Study Commission
Southeast River Basins

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TO REPORT OF
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SOUTHEAST RIVER BASINS

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FOREWORD

This Appendix summarizes the results of studies made in formulating a comprehensive plan for the conservation, utilization, and development of the land and water resources of the Satilla-St. Marys basins. The plan for the Satilla-St. Marys basins is a part of the comprehensive plan for the development of the land and water resources of the Southeast River Basins.

Data relevant to the development of the land and water resources of the Satilla-St. Marys basins are summarized in six interrelated parts. The matter contained in each part is pertinent to the comprehensive plan. The reader is urged to consider the Report in the aggregate rather than to consider selected material out of context.

Part One includes a description of the area, a discussion of its resources, and a presentation of the present and future population and economy. Part Two presents the level of needs by purpose. Part Three describes planning procedures as applied to this study. Part Four presents the comprehensive plan, including improvements requiring early action, for the Satilla-St. Marys basins; Part Five contains the conclusions; and Part Six acknowledges the assistance of public and private agencies and individuals.

The Report of the United States Study Commission summarizing the plan for the Southeast River Basins is made in response to the provisions of Public Law 85-850 (72 Stat. 1090) dated August 28, 1958, which established the United States Study Commission, Southeast River Basins. Public Law 85-850 is reproduced in Appendix 13.

The authorizing Act provides for an integrated and cooperative investigation to formulate a comprehensive and coordinated plan for:

- (1) Flood control and prevention;
- (2) domestic and municipal water supplies;
- (3) the improvement and safeguarding of navigation;
- (4) the reclamation and irrigation of land, including drainage;
- (5) possibilities of hydroelectric power and industrial development and utilization;
- (6) soil conservation and utilization;
- (7) forest conservation and utilization;
- (8) preservation, protection, and enhancement of fish and wildlife resources;
- (9) the development of recreation;
- (10) salinity and sediment control;
- (11) pollution abatement and the protection of public health; and
- (12) other beneficial and useful purposes not specifically enumerated in the Act.

The comprehensive plan for the Southeast River Basins is formulated to meet the needs of the area for land and water resources development to the year 2000. Projects and programs existing and under construction in 1960 are reflected in the plan, but only 1960-2000 developments are analyzed.

The plan for the development of the resources of the Southeast River Basins and the Satilla-St. Marys basins is the result of cooperative work of Federal, State, and local and private agencies having interest in the area and knowledge of its needs and requirements. Public hearings were held early in the planning process to obtain firsthand knowledge of conditions and problems in the study area and to secure suggestions for their solution. Throughout the study, liaison was maintained with interested groups and agencies by means of conferences and committee and advisory group meetings. When a tentative plan was developed, public presentations were made by the Commission to inform interested persons and organizations and to request comments. These comments were considered in preparing the final plan and Report.

Although many individuals, groups, and agencies have participated in the studies, the Commission takes full responsibility for the plan and for the projections, assumptions, and analyses on which it is based.

The Commission plan for the Southeast River Basins is supported by data contained in 13 appendixes. Data on the plan for development of the resources in the eight geographic areas

studied in the Southeast River Basins are contained in Appendixes 1 through 8. Technical data and information applicable to both the entire study area and the several geographic areas are contained in Appendixes 9 through 13. The appendixes to the Commission Report are as follows:

Appendix	Title
1	Savannah Basin
2	Ogeechee Basin
3	Altamaha Basin
4	SATILLA-ST. MARYS BASINS

Appendix	Title
5	Suwannee Basin
6	Ochlockonee Basin
7	Apalachicola-Chattahoochee-Flint Basins
8	Choctawhatchee-Perdido Basins
9	Economics
10	Hydrology
11	Engineering and Cost
12	Planning
13	History and Organization of the Commission

U. S. STUDY COMMISSION
SOUTHEAST RIVER BASINS

Appendix 4
SATILLA-ST. MARYS BASINS
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THE SATILLA-ST. MARYS BASINS



Figure 1.2

PART ONE – STAGE FOR DEVELOPMENT

SECTION I – BASINS AREA

Description

The Satilla-St. Marys basins area lies in southeastern Georgia and northeastern Florida. The area is about 110 miles long and averages about 50 miles in width. The western extremity of the basins is near the town of Fitzgerald in the south-central part of Georgia. The basins extend southeastward to the Atlantic Ocean. The basins embrace a land and water area of 5,520 square miles, of which 4,375 square miles are in Georgia, and 1,145 square miles are in Florida. About 3,530 square miles of the basins area are in the

Satilla River drainage area; 1,510 square miles are in the St. Marys River drainage area; 400 square miles are in the Nassau River drainage area; and about 80 square miles drain into the Atlantic coastal estuaries. Included in the area of the basins are 38 square miles of small water bodies and 95 square miles of large water bodies. Almost all of the area is in the Lower Coastal Plain. There are 71 square miles of the Upper Coastal Plain in the northwest tip of the Satilla River watershed. Nearly four-fifths of the basins area has woodland cover.



Figure 1.3 *Farm near Baxley, Georgia. Agricultural Activities Are Important to the Basins Economy.*

The Satilla River rises in Coffee and Ben Hill Counties, Georgia, at an elevation of about 300 and 350 feet, respectively, and flows generally southeasterly about 260 miles to empty into the Atlantic Ocean at St. Andrew Sound.

The St. Marys River rises in Okefenokee Swamp at an elevation of 120 feet and has a length from the swamp of about 125 miles. It flows south from the swamp, turns back to the north, to the vicinity of Folkston, and then flows easterly to the Atlantic Ocean. From the Okefenokee Swamp to its mouth, the river forms the boundary between Georgia and Florida.

The Nassau River drainage area consists of low lying coastal land between the St. Marys basin and the complex of coastal streams flowing into the St. Johns River to the south. It extends about 31 miles inland from the Atlantic Ocean, and elevations of the basin range up to 90 feet.

A small part of the Okefenokee Swamp is in the Satilla-St. Marys basins. This swamp occupies an area which once contained a body of salt water that was partly cut off from the open ocean by a sand spit and barrier reef now called Trail Ridge. When the shorelines retreated, that part of the sound which became the swamp was reduced to a shallow lake with islands and overflow outlets through which the source waters of the Suwannee and St. Marys Rivers now flow.

The Lower Coastal Plain portion of the basins is nearly flat and has much low wetland and marshes. The streams and rivers that traverse this area have wide flood plains, and much of this land is covered with swamps and pine and hardwood forests. The seaward part of the Lower Coastal Plain portion of the basins becomes an indistinct merger of land and sea that ranges from 15 to 20 miles in width with irregular and sometimes intricate edging of estuaries, sloughs, lagoons, mud flats, brackish swamps, and fringing islands. The lower portion of the Satilla River is a tidal estuary.

Geology and Soils

The geologic formations in the basins consist chiefly of stratified beds of sands, marl, limestone, and clay. Many of these formations are highly permeable and some contain water under artesian pressure.

There are also many bays or depressions containing organic matter that remain wet much

of the time. The soils in the basins were developed from the sedimentary deposits of sand, clay, and limestone. In general, they are gray in color and usually are sandy.

The potential for the development of minerals in the Satilla-St. Marys basins does not appear to be of major significance although clay, gypsum, seashells, heavy minerals, and sand and gravel for glass and other purposes are available.

Climate

The basins have long, warm summers and short, mild winters. The coastal portion is slightly warmer in winter and receives more rain in summer and fall than interior areas, but rainfall is usually plentiful throughout the basins. Snowfall is extremely rare.

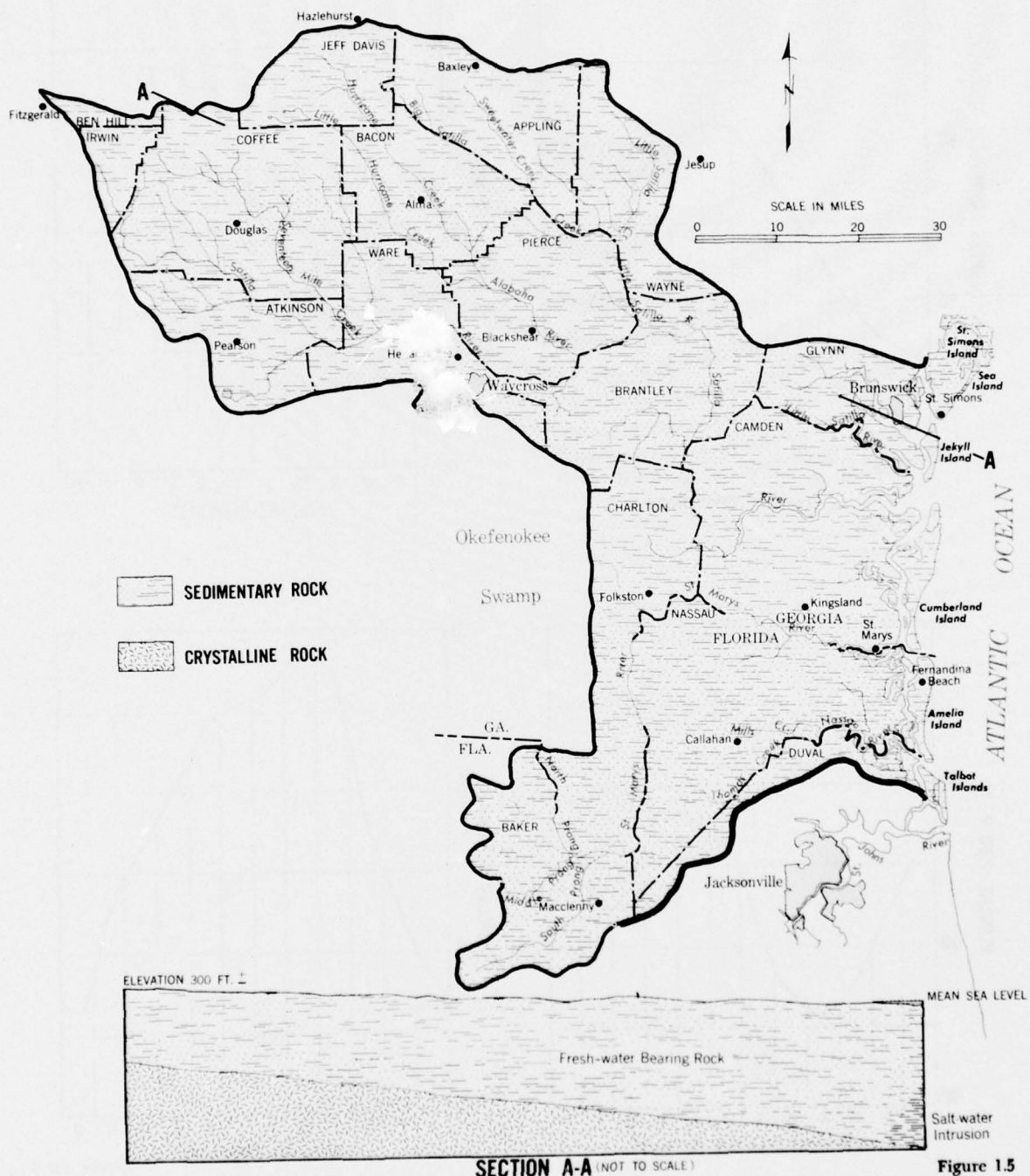
The average annual temperature is 68°. The average daily temperature ranges from 54° in January to 82° in July. In January, the average daytime minimum and maximum temperatures range from 44° to 64°, and in July from 72° to 92°. During an average year, the temperature drops below 32° about 20 times in the northwest area and about 6 times along the coast. Ninety degrees is exceeded in an average year about 70 times along the coast and slightly more than 100 times in the northwest portion of the area. The frost-free growing season of the area ranges from about 250 days near Douglas, Georgia, to 300 days along the coast.

The average annual relative humidity at 1:00 p.m. is 53 percent and monthly averages range



Figure 1A The Climate of the Basins Is Favorable for Many Crops.

GENERAL GEOLOGY



CLIMATE

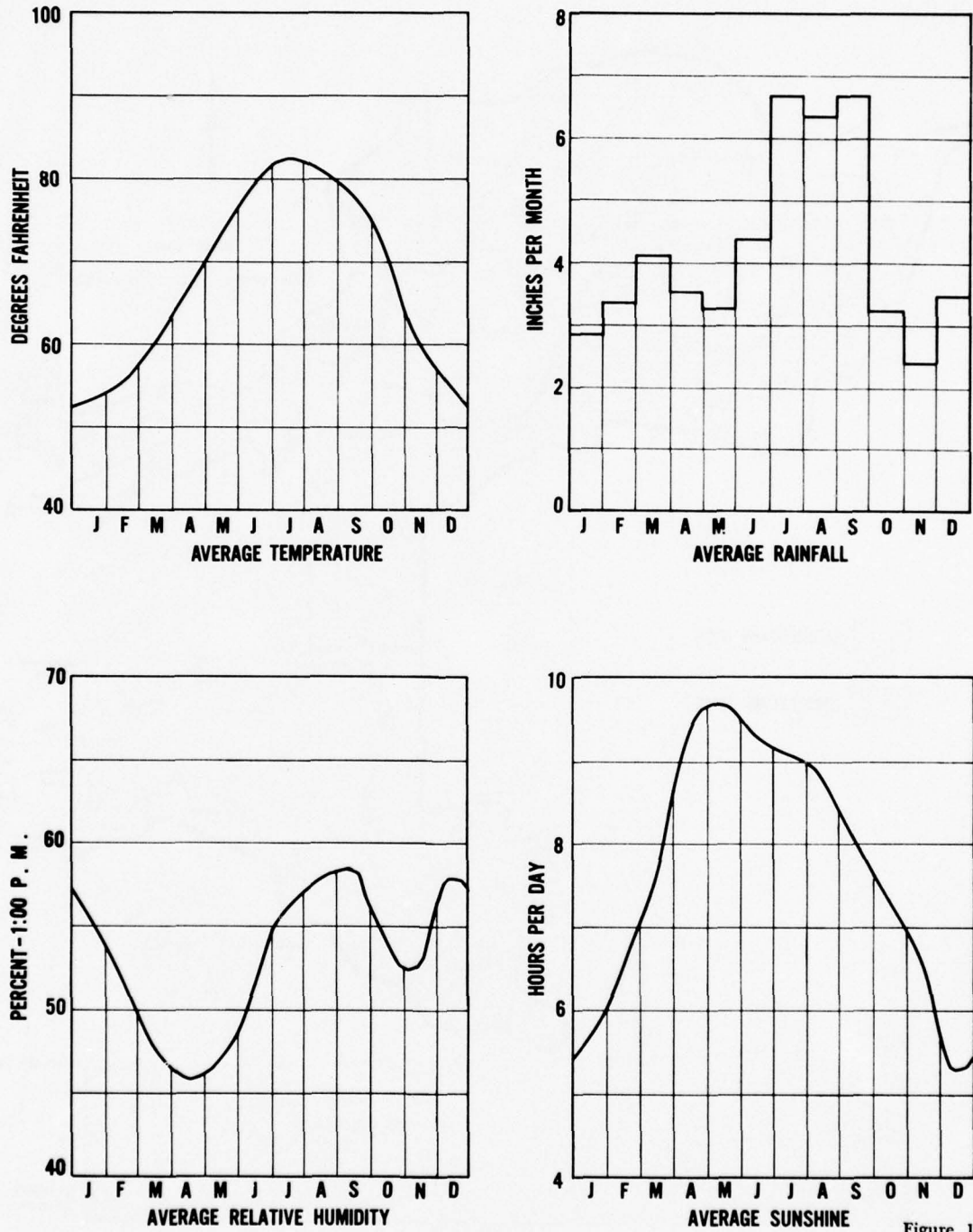


Figure 1.6

from a low of 46 percent in April to a high of 58 percent for the months of September and December.

The basins average 9 hours of sunshine a day in the summer and 5 to 6 hours a day in the winter. Summer rainfall is characterized by brief showers. There are few completely cloudy days.

The winter heating requirements in the Satilla-St. Marys basins are much less than in northern areas. The mild climate permits building and other outdoor activities throughout the year. Normal transportation is not restricted because of winter temperatures.

The average yearly rainfall over the area ranges from about 44 inches in the Satilla River headwaters to 52 inches near the coast. Rainfall during the 3 wettest months, July through September, averages about 6.5 inches per month. Rainfall during the relatively dry fall and winter months averages about 3 inches per month.

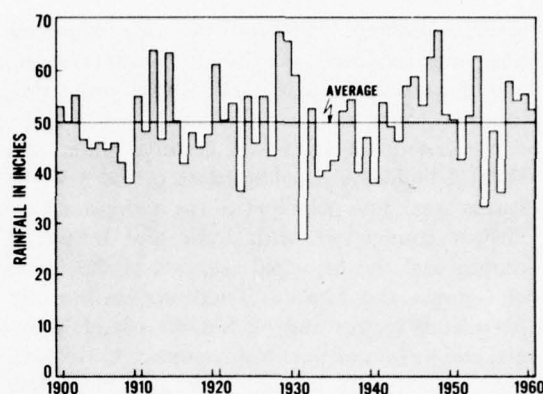


Figure 1.7 Annual Rainfall at Waycross, Georgia.

A maximum 24-hour rainfall of 19.1 inches occurred at St. George, Georgia, in August 1911. Severe droughts are uncommon, however, some soil moisture deficiencies occur each year due to unfavorable rainfall distribution.

SECTION II – BASINS RESOURCES

Land

The land resources of the basins are used principally for forestry and agriculture. Other uses include land for wildlife, recreation, transportation, industrial purposes, and for cities and towns.

There are four major forest types in the basins—pine, bottom land hardwoods, oak and pine, and the upland hardwoods. Pine is the most important forest type, and it covers more than 70 percent of the forest area.

Cropland occupies about 8 percent of the basins land area. Corn leads in acreage followed by cotton, tobacco, soybeans, peanuts, and hay. About 12 percent of the cropland was idle in 1959. About 3 percent of the basins land area is presently used for pasture. The better lands have been selected for cropland use with over 90 percent of the crops on the better land as described in Section VI of Part Two.

Of the 379,000 acres classed as special and other land, 161,000 acres are in swamps and

TABLE 1.1
Land Use—1959

Land use	Land area ¹					
	Florida		Georgia		Satilla-St. Marys basins	
	(acre)	(percent)	(acre)	(percent)	(acre)	(percent)
Crop	10,000	1	271,000	10	281,000	8
Pasture ²	19,000	3	77,000	3	96,000	3
Forest	643,000	90	2,073,000	75	2,716,000	78
Special and other	39,000	6	340,000	12	379,000	11
Total	711,000	100	2,761,000	100	3,472,000	100

NOTES: ¹ Includes 61,000 acres of small water bodies, but excludes 24,000 acres of large water bodies.

² Includes cropland pasture.

marsh and about 43,000 acres are used for recreation and fish and wildlife purposes. The remainder is used for urban, residential, industrial, transportation, and service areas.

A network of improved county, State, and Federal highways provide access to most of the basins area. The principal towns and cities have railway connections with trade and industrial centers and the principal seaports of the States of Georgia and Florida. There are civilian airports at Waycross and St. Simons Island, Georgia, and a Navy airport near Brunswick, Georgia.

Existing public recreation areas include Federal, State, county, and private developments. Federal developments are the Fort Frederica National Monument and Osceola National Forest.

Developments by the State of Florida are Fort Clinch and Little Talbot Island State Parks which have good ocean beaches. Cary State Forest, owned by the State of Florida, has no recreation facilities but the area is available for recreation use. Developments by the State of Georgia include Jekyll Island, Crooked River,

and Laura S. Walker State Parks, all of which have facilities for fishing, swimming, and picnicking. Waycross State Forest has no recreation facilities, but the land is owned by the State of Georgia and the area is available for recreation use. Commercial beach developments are located at Sea Island Beach, Georgia; on the ocean side of St. Simons Island, Georgia; and Fernandina Beach, Florida.

Potential recreation resources are those of natural and scenic interest, such as Cumberland Island, Georgia; the south end of Amelia Island, Florida; and the town of St. Marys, Georgia.

Water

The combination of climate and physical features usually provides an ample supply of surface and ground water throughout the basins. Permeable sedimentary formations are the major source of water for deep wells in the basins.

Of the basins 5,520 square miles, the Satilla, St. Marys, and Nassau Rivers, respectively, drain 64, 27, and 7 percent of the total area. Included



Figure 1.8 *Fernandina Beach, Florida, Is One of Many Good Ocean Beaches in the Basins.*



Figure 1.9 *Cypress Ponds Are Numerous in the Basins.*

in the total are the intervening coastal drainage areas. Throughout most of their lengths, the rivers have slopes averaging less than one-half foot per mile.

There are no large storage reservoirs, hydro-electric plants, or major diversions in the basins. There are many small lakes, small reservoirs, and farm ponds. In the aggregate, these have little effect on streamflow.

The rivers and their tributaries have considerable natural beauty and are used for both boating and fishing, particularly in the lower reaches.

The Atlantic Intracoastal Waterway extends along the coast of the basins and provides a protected route for commercial and pleasure craft.

The runoff of the basins averages about 10 inches annually, or 3 million acre-feet. Ten inches is slightly more than the average for the United States and less than that of the Southeast area as a whole. The yearly difference between rainfall and runoff results from evaporation, transpiration, and deep seepage into the ground. Total streamflow varies greatly from year to year. The highest measured annual flow of the Satilla River at Waycross, Georgia, since streamflow records were begun in 1937, was more than 33 inches average depth over the drainage area and occurred in the water year 1948. Rainfall during the corresponding 12 months was also high, exceeding 67 inches at



Figure 1.10 *The Natural Beauty of the Lower Satilla River Enhances Its Potential for Recreational Development.*

Waycross. The lowest 12 months runoff since 1937 was less than 1 inch average depth in the period April 1954 through March 1955. Rainfall during this period was very deficient, being 17 inches below normal. In 1931, rainfall at Way-

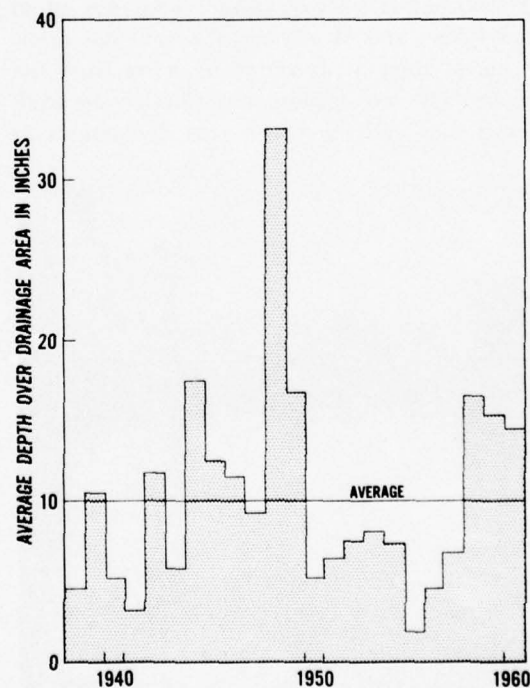


Figure 1.11 *Annual Runoff, October 1 Through September, Satilla River at Waycross, Georgia.*

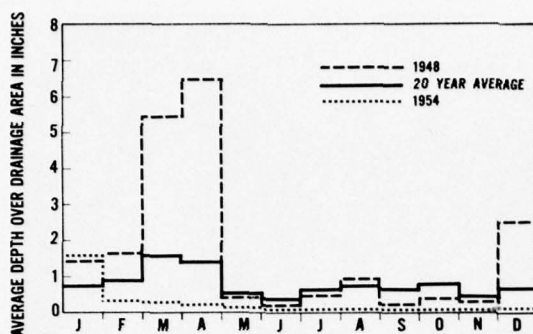


Figure 1.12 Monthly Runoff, Satilla River at Waycross.

cross, was only about 28 inches, scarcely enough to satisfy demands for evaporation and transpiration.

In addition to the year-to-year variability in flow, there is also great variation within a year. Streams in the basins are typically high in the winter and early spring, with a lesser rise in late summer and fall.

Ground water storage and movement are influenced by the physiographic and geologic characteristics of the basins, by rainfall over the recharge areas, and by withdrawals from wells. The principal artesian aquifer underlies all of the basins and is recharged over large areas. Some of these areas are many miles from the basins. The rate of movement through the aquifer is slow and the year-to-year fluctuations in

recharge from rainfall are smoothed out. Wells in the principal aquifer yield several thousand gallons per minute. Well depths in the principal aquifer range from 500 to 600 feet in the upper basins area to about 1,000 feet near the Atlantic coast. However, limited supplies of water are usually available in sand and gravel within 30 feet of the surface.

The surface water of the basins is generally of good quality and extremely soft. Average hardness of surface water is about 15 parts per million. The average hardness of ground water is about 200 parts per million. Water in the lower reaches of streams is darkly stained by materials steeped from organic debris in nearby swamps.

Sediment concentrations of about 20 parts per million occur in the Satilla River. The sediment load increases with increased flows.

The mean range of tidal heights at the mouth of the Satilla River is 6.9 feet. Tidal effects extend up this river for a distance of about 67 miles. Tidal effects in the St. Marys River, which has a mean range of tides at the mouth of 5.8 feet, extend about 60 miles above the mouth of the river. The mean range of tide at the mouth of the Nassau River is 5.4 feet and the tidal effects in the river extend up to the town of Callahan, Florida.

Salt-water wedges extend up streams nearly as



Figure 1.13 The St. Marys River Is Navigable to Traders Hill, Georgia, 58 Miles Above the Mouth.

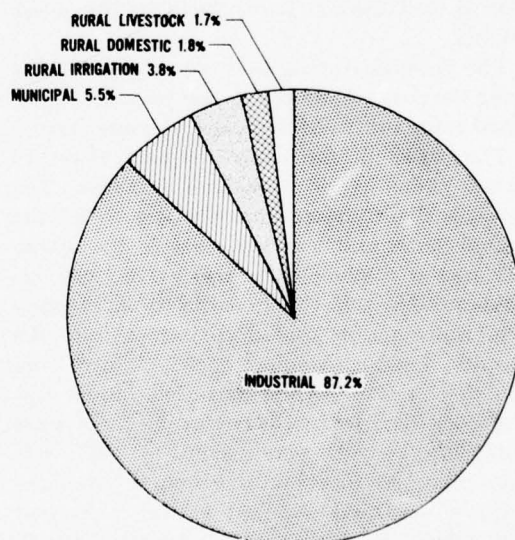


Figure 1.14 Water Use in Satilla-St. Marys Basins in 1960.



Figure 1.15 *Farm Ponds Provide Multiple-Use Benefits—Flood Prevention—Water Supply—Fishing—Recreation.*

far as the tidal effect but their extent is reduced by the flow of the streams. The only serious salinity problem appears to be the intrusion of sea water into the aquifer near Brunswick. This salt-water intrusion occurs near the coast where there is heavy pumping and where the wells are close together.

The water temperature in the larger streams of the basins varies from 55° Fahrenheit in winter to 80° in summer. Water in smaller streams has a greater range and a more rapid temperature fluctuation. The ground water temperature averages about 70°.

The ground water is generally alkaline but its alkalinity varies. As with the surface water, the ground water quality is generally good.

The 66 billion gallons of water withdrawn from wells and streams in the basins each year for rural, municipal, and industrial uses, represent about half of 1 percent of the average sustained supply available from both surface and ground water sources. Practically all the water used in the basins is withdrawn from wells.

In 1960 about 184 million gallons of water per day were used in the Satilla-St. Marys basins. Rural residents used about 50 gallons per person each day or a total of about 3.2 million gallons per day. Reports show that about 6 percent of the rural supplies have water shortages from early July through September.

In 1960, about 7,900 acre-feet of water were withdrawn for irrigation. In addition, about 3.1

million gallons a day were used for watering livestock.

Water uses for all rural purposes totaled an average of about 15,000 acre-feet per year, or approximately 7 percent of the water used.

Municipal uses total 10.1 million gallons a day, or about 6 percent of the water used. Muni-

cipal water consumption in the basins averages about 95 gallons per day for each person, compared to 116 gallons a day per person for the Southeast and 147 gallons for the Nation.

The basins industries used about 160 million gallons of water a day, about 87 percent of the water used.

SECTION III – PEOPLE IN THE BASINS

History

The Indians who inhabited the Satilla-St. Marys basins prior to the appearance of Europeans had several villages on an island they called Asao. When the Spanish arrived in the 1500's, they renamed the island San Simon, established several mission-presidios, and introduced agriculture.

The Spanish dominated the region with the sword and the cross for over a century. England eventually became concerned over the Spanish threat to South Carolina, and in 1663, Charles II extended land grants as far south as St. Augustine, Florida. These grants initiated a long conflict for the area.

In 1732, George II granted a trustee charter to a group of prominent Englishmen to establish a colony in Georgia. Under this trusteeship,

James Oglethorpe brought the first actual colonists to the area. Oglethorpe laid out the military town of Frederica on St. Simons Island as his base of operations. To protect the new settlements from the Spanish, he had Fort St. Simon built at the southern end of the island and Forts St. Andrew and William built on Cumberland Island.

Settlement of the area was slow until the Spanish threat abated and the trusteeship expired. Georgia became a royal colony in 1754, and by that time the main tide of immigration from Virginia and the Carolinas had set in. The Indian cession in 1763 of the coastal lands between the Altamaha and the St. Marys Rivers made considerably more land available for settlement. This cession included most of the Satilla-St. Marys basins. Although Frederica under Oglethorpe was a bustling community of British Regulars, Scottish Highlanders, and Indians, it dwindled after his return to England. Brunswick, established on the mainland in 1771, soon overshadowed Frederica. For half a century, following the War of 1812, the island and mainland cotton and rice plantations flourished and prospered.

During the Civil War, the exposed location of Brunswick and St. Simons Island made defense difficult, and the inhabitants fled to the safety of inland towns. Brunswick and St. Simons Island fell to Federal troops in July of 1862 and the area was used as a refuge for freed slaves. The Civil War left much of the area devastated. Cultivation of rice, the principal money crop of the coast, was unsuccessful and had to be abandoned when the great tidal wave of 1898 destroyed the dikes and flooded the fields. The post-reconstruction period was one of agricultural depression. With the absence of money wages, the sharecrop system was established



Figure 1.16 Fort Frederica National Monument, St. Simons Island, Georgia, is the site of Oglethorpe's Eighteenth Century Fortified Town.



Figure 1.17 *Sea Island Is One of Georgia's Finest All-Year-Round Resort Islands.*

whereby tenants worked small acreages and divided the crop with the landlord. This system dominated agriculture well into the twentieth century.

After World War I, a new menace, the boll weevil, plagued the South. Cotton production was cut in half within 3 years. This disaster gave impetus to the migration of Negroes away from the farms, and cotton production never fully recovered.

Several of the old coastal plantations are being used to raise cattle and fresh vegetables, particularly lettuce. Others have been abandoned by farmer tenants. A large part of the area produces pulpwood or is sustained by cotton, tobacco, corn, peanuts, timber, and livestock.

St. Simons Island contains a thriving resort community. This island and the smaller Sea Island have become two of Georgia's four coastal resort islands that are open to the public. Jekyll Island, formerly an exclusive, private retreat, was acquired by the State of Georgia in 1947. After creation of the Jekyll Island State Park Authority and the construction of a bridge, the island was opened to the public.

Population Development

The population of the Satilla-St. Marys basins was 165,500 persons in 1960. About 80 percent resided in Georgia and about 20 percent in Florida. The 1960 total represented a 28 percent increase over the 1930 population. This was somewhat less than the 34 percent overall increase in the Southeast River Basins area from 1930 to 1960.

The basins population is expected nearly to double in number from 1960 to the year 2000, assuming favorable resource development conditions. This rate of increase will probably be slightly less than that of the Southeast River Basins or the Nation.

The basins 1960 population was over 50 percent urban. This was significantly different from 1930 when almost three-fourths of the population was rural. The decline in the rural farm population is expected to continue, but at a somewhat lower rate than for the Southeast River Basins area as a whole.

Brunswick is one of Georgia's principal sea-ports and the largest city in the Satilla-St. Marys basins. Next in size are Waycross and Douglas in

POPULATION DENSITY 1960

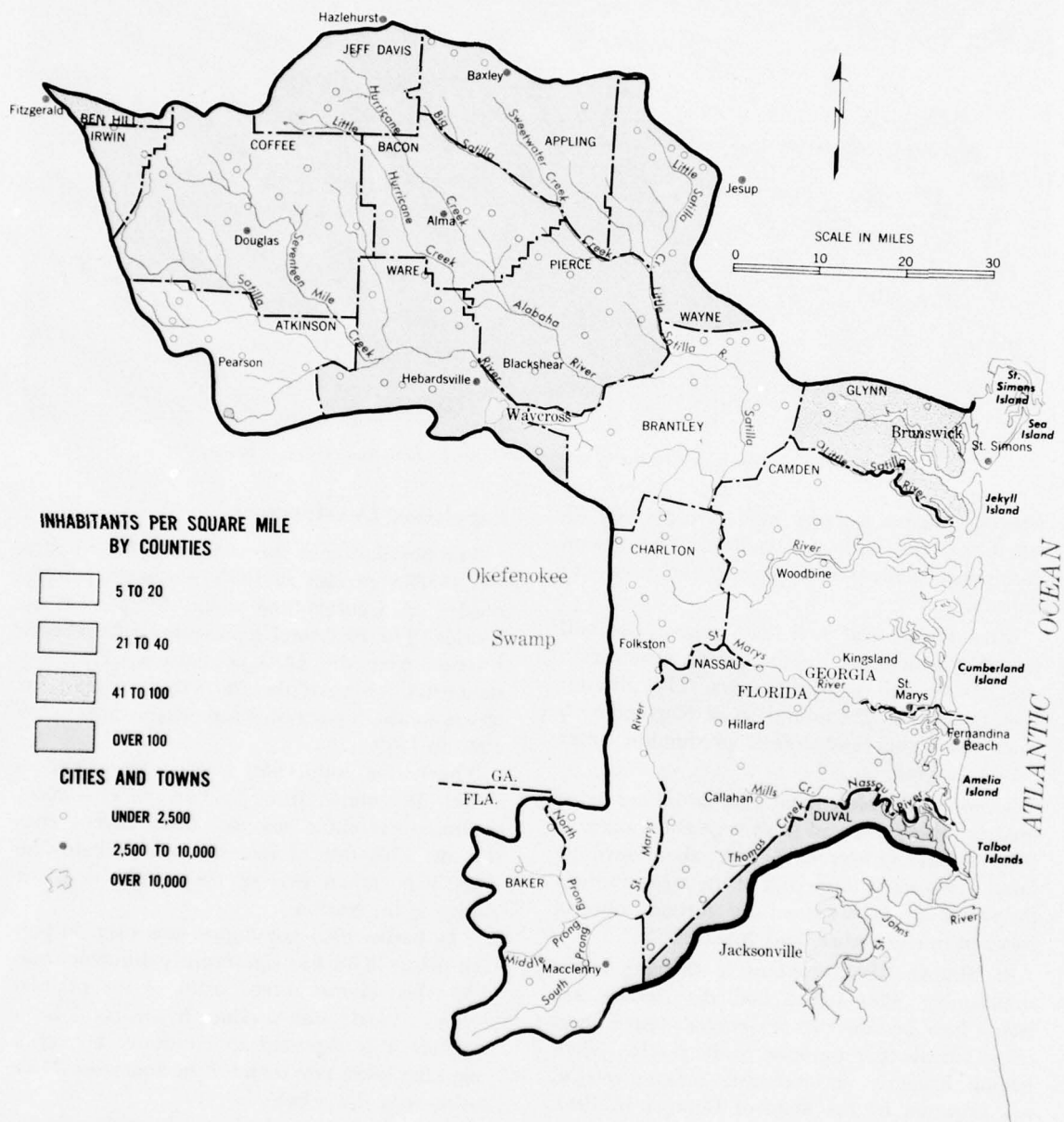


Figure 1.18

Georgia and Fernandina Beach in Florida. The major population growth is expected to occur in the urban areas.

Population Characteristics

Although the people of the Satilla-St. Marys basins are typical of the Southeast in general and

TABLE 1.2
Urban and Rural Population by
States—1930, 1960, 1975, and 2000

	1930			1960		
	Florida	Georgia	Basins total	Florida	Georgia	Basins total
Rural	14,900	77,800	92,700	22,100	59,600	81,700
Urban	3,000	33,700	36,700	10,000	73,800	83,800
Total	17,900	111,500	129,400	32,100	133,400	165,500
	1975			2000		
	Florida	Georgia	Basins total	Florida	Georgia	Basins total
Rural	21,500	54,600	76,100	15,900	47,000	62,900
Urban	18,100	115,000	133,100	40,300	214,000	254,300
Total	39,600	169,600	209,200	56,200	261,000	317,200

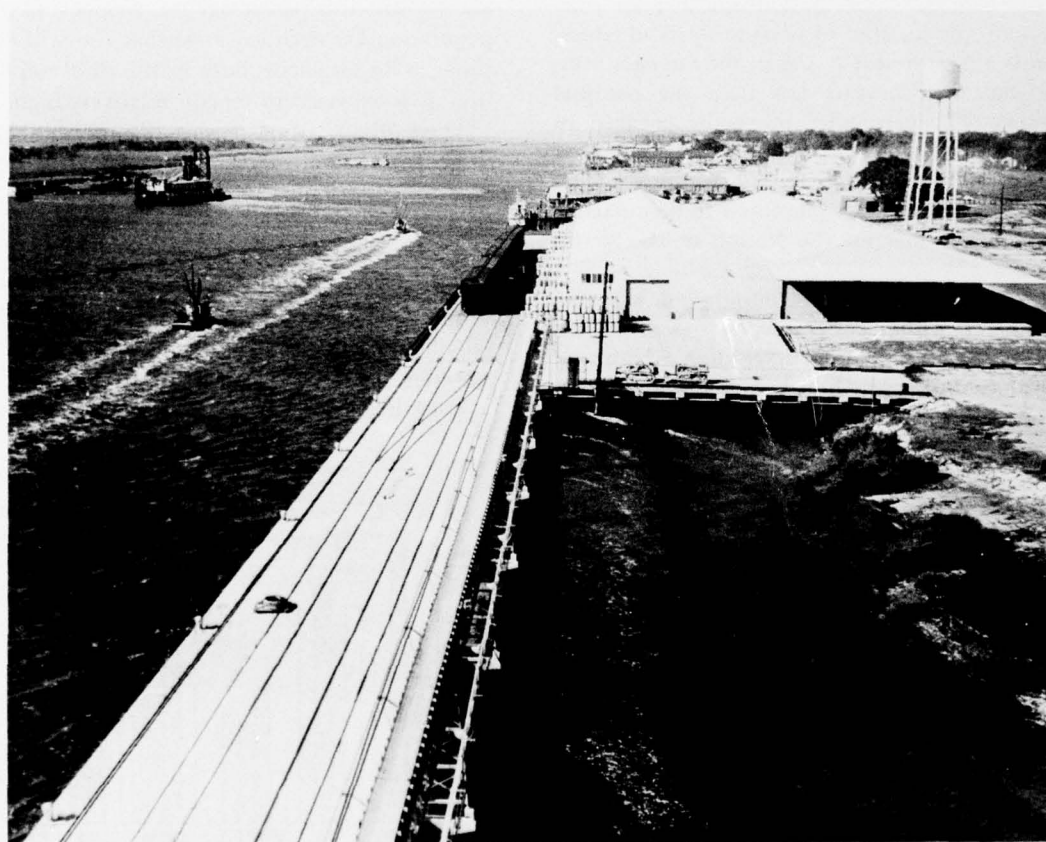


Figure 1.19 Port Developments Along East River, Brunswick, Georgia, Are Indicative of the Industrial Growth.

TABLE 1.3
Urban Centers in the Basins with Populations Above 3,000 in 1960

Location	County	1940	1950	1960
Brunswick, Georgia	Glynn	15,035	17,954	21,703
Waycross, Georgia	Ware	16,763	18,899	20,944
Douglas, Georgia	Coffee	5,175	7,428	8,736
Fernandina Beach, Florida	Nassau	*	*554	7,276
Baxley, Georgia	Appling	2,916	3,409	4,268
Alma, Georgia	Bacon	1,840	2,588	3,515
St. Marys, Georgia	Camden	733	1,348	3,272
St. Simons, Georgia (unincorporated)	Glynn	---	---	3,199

* Fernandina, which was incorporated with Fernandina Beach after 1950, had a population of 3,492 in 1940 and 4,420 in 1950.

Georgia in particular, the population as a whole has characteristics which depart in varying degrees from regional and State characteristics.

Certain characteristics of the basins population in relation to the State and Nation are shown in Figure 1.21. In addition to these comparisons, the number of years devoted to education is almost a year less than the Georgia average and over 2 years less than the national average. The percentage of people engaged in agriculture is above the national average and considerably above that for the Southeast. Conversely, the percentage employed in manufacturing is below that for the Nation or the Southeast.

In the past, the basins population was predominantly rural. Only recently has urban exceeded rural population. Excluding Glynn and Duval Counties which are in the metropolitan areas of Brunswick, Georgia, and Jacksonville, Florida, the population of the remaining counties of the basins was still more than 60 percent rural in 1960.

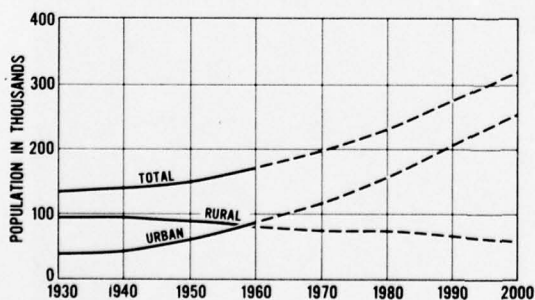


Figure 1.20 Urban and Rural Population and Projected Population.

The residents are predominantly native-born Protestants as in most parts of the Southeast. The nonwhites in the Satilla-St. Marys basins represent about 25 percent of the population which is substantially above the national average. While the percentage of Negroes in the population has declined somewhat and will continue to do so, particularly in the rural population, it is expected to remain relatively high.

The Satilla-St. Marys basins, like the Southeast in general, have had relatively high birth rates and low death rates. The resultant, high natural increase has been moderated by out-migration. A large proportion of those migrating has been middle-aged adults seeking employment opportunities. These circumstances have produced a population with a relatively high percentage of children and elderly persons.

More than one-half of the population in the

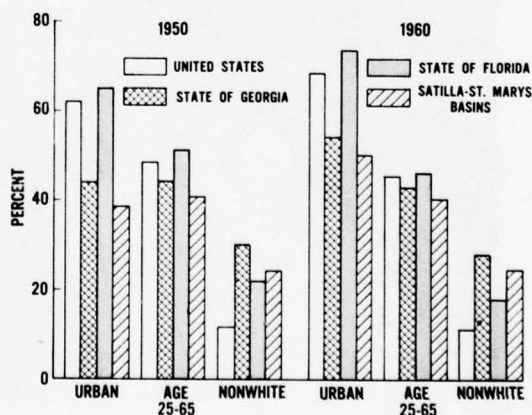


Figure 1.21 Comparative Population Characteristics.

Satilla-St. Marys basins was under 25 years old in 1960. More than 6 percent of the population was 65 or over. Only two-fifths of the population were adults in the usual working-age group ranging from 25 to 65 years old.

Factors Affecting Population Change

The out-migration has had a significant influence on the population of the basins. The heavy concentration of population in the younger and older age groups limits the labor force available to participate in economic activity and production. However, as economic development occurs, the basins will have a proportionately larger group maturing into the labor force. As adequate employment opportunities are provided and out-migration is reduced, the large maturing labor force can be an important advantage for economic development. However, the present age distribution imposes a heavy economic burden on a small working group. The present small labor force must continue to educate, train, govern, and sustain a relatively large segment of the population. If adequate employment opportunities are not available, large numbers of the better educated and better trained people will continue to be lost to competing areas. Conversely, if such opportunities are to be provided by economic development, an adequately educated and trained labor force must



Figure 1.22 Library, South Georgia College, Douglas, Georgia.

be made available. Continued improvement of the relatively low educational level of the basins will be required.

In spite of the area problems, a concerted effort is being made to prepare the young people for current and future needs by the construction of vocational schools and improving the educational opportunities. As employment opportunities are provided and out-migration is reduced, adequate training of the young persons entering the labor force will give the area an important advantage for economic development.

The projections of the future basins population used in this Report reflect the assumption that the factors that have led to heavy out-migration in the past will be overcome.

SECTION IV – BASINS ECONOMY

Existing Economic Development

The Satilla-St. Marys basins have a temperate climate and an abundant supply of good land and water. These form a setting within which further economic development can occur. Active and accelerated economic development will contribute immensely to the welfare of the basins, the region, and the Nation.

The basins lie almost entirely within the Lower Coastal Plain. In addition to the many forest products, the basins also produce and process a wide assortment of agricultural and manufactured products.

Total employment in the basins in 1960 was 60,700. Of these, 10,800 or 18 percent were employed in agriculture and 13,500 or 22 percent

were employed in manufacturing. The remaining 60 percent or 36,400 was employed in trades, services, and jobs other than manufacturing and agriculture.

Of the 13,500 people employed in manufacturing, 3,800 were engaged in the pulp and paper products industries. Twenty-six hundred were employed in the food industries and over 2,000 were employed in the lumber and wood industries. Thirteen-hundred people were employed in the chemical industries. Other manufacturing employment categories, in order of their magnitude, were the apparel; metal; stone, clay, and glass; and printing-publishing industries.

Manufacturing has been somewhat dispersed

ECONOMIC ACTIVITY 1960

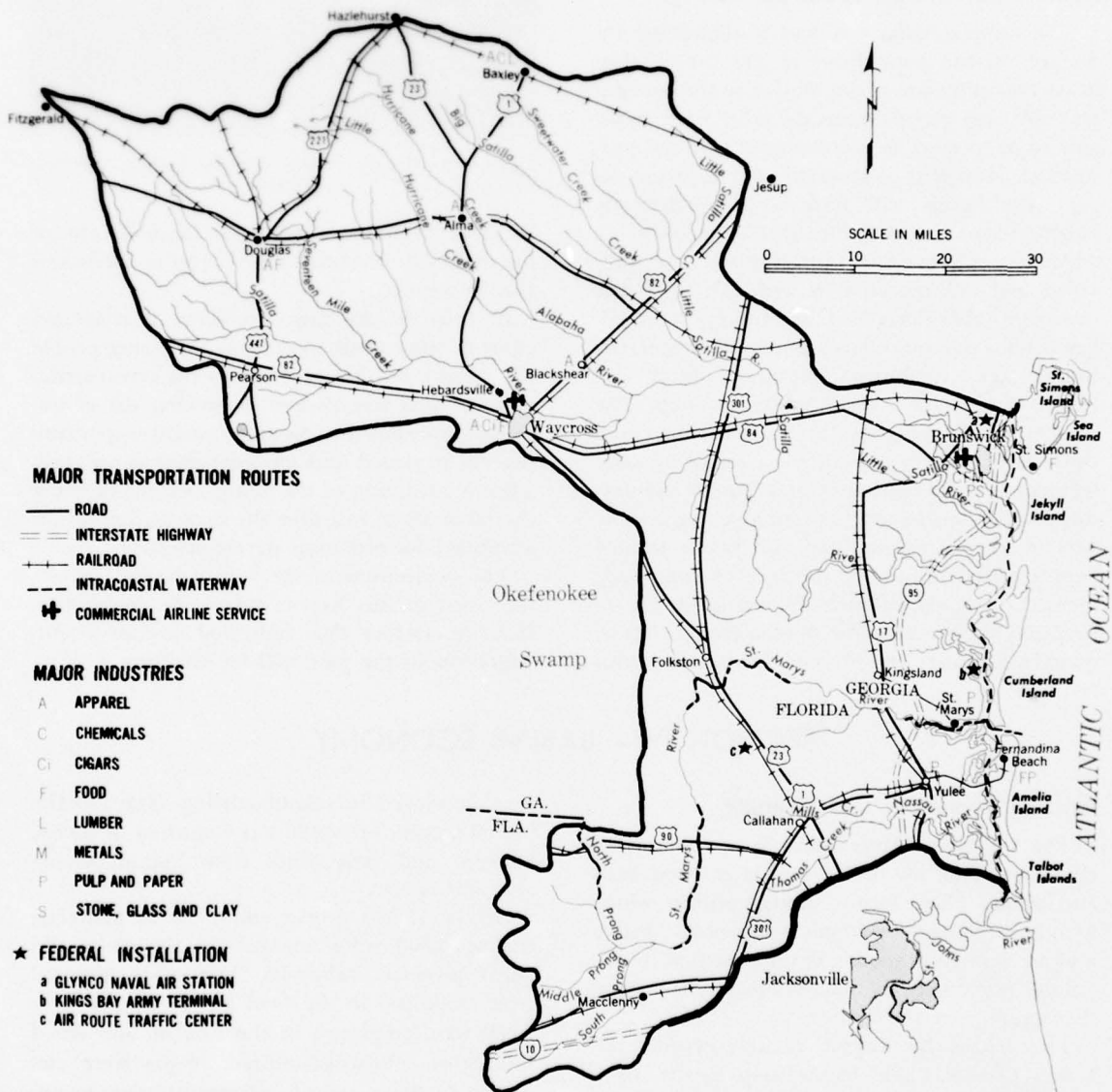


Figure 1.23

over the basins in recent years as new plants were put into operation. This is particularly true of smaller plants like those of the apparel industries. However, manufacturing activity continues to be concentrated in the urban areas, particularly around Brunswick and the coastal areas where gypsum, metal, and pulp and paper-products plants are located. Manufacturing and processing plants in the basins total about 250. About 75 of these process food products, about 25 process forest products, and about 20 make metal products.

Distribution of employment reflects the general characteristics of economic activity within the basins. The magnitude and significance of these economic activities are further emphasized by the total personal income which they help generate in the basins. Total personal income in the basins was \$228 million in 1960. This was an increase of about one-third over the total personal income of 1950 and almost four times the total personal income of 1939. The per capita income for the basins in 1960 was \$1,378. This was about three-fifths of the national average

TABLE 1.4
Employment—1960

Area	Agriculture		Manufacturing		NANM*		Basins total	
	Em- ployees	Per- cent	Em- ployees	Per- cent	Em- ployees	Per- cent	Em- ployees	Per- cent
Georgia	10,300	17	11,000	18	30,300	50	51,600	85
Florida	500	1	2,500	4	6,100	10	9,100	15
Total	10,800	18	13,500	22	36,400	60	60,700	100

* Nonagricultural and nonmanufacturing.

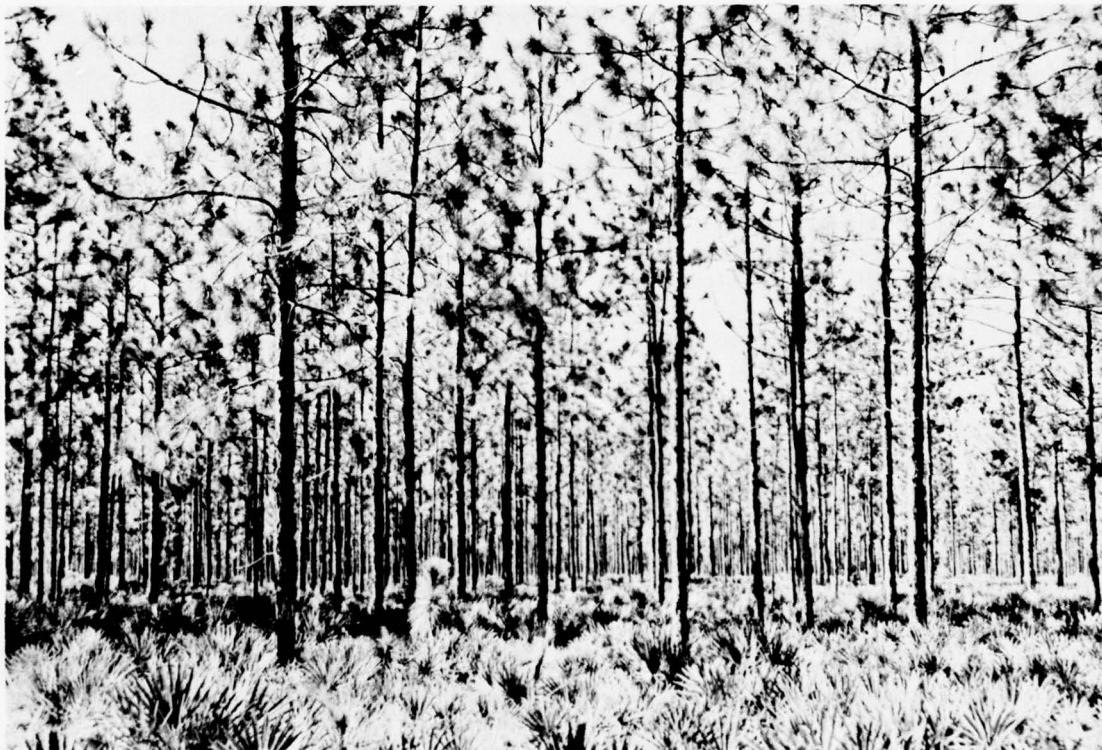


Figure 1.24 Natural Stand of Slash Pine. Lumber and Naval-Stores Products Are Important Sources of Income.

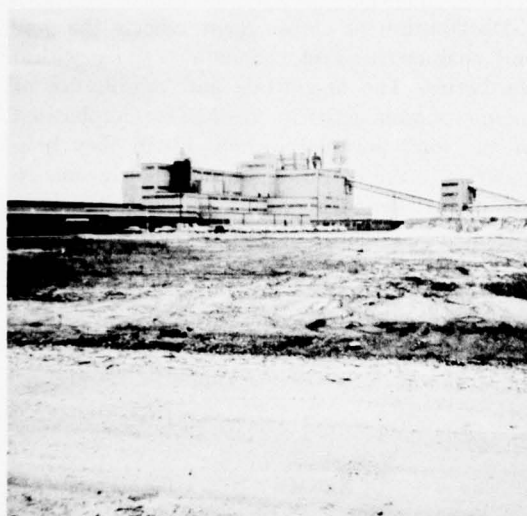


Figure 1.25 Gypsum Plant, Brunswick, Georgia. Manufacturing Is Becoming Increasingly Important in the Area.

and 87 percent of the average for the Southeast River Basins area. The rate of gain in per capita income from 1939 to 1960 has been slightly more for the Satilla-St. Marys basins than for the Southeast River Basins area as a whole.

Lumber and naval-stores products were valued at \$13.6 million in 1959. The basins forests have been and will continue to be an important source of income in the basins.

Agriculture is a significant component of the basins economy. The activities are carried on throughout the basins. However, excluding some commercial vegetable production, these are more heavily concentrated in the north and north-western portions of the basins.

In 1959, the major crops produced were cotton, peanuts, corn, and commercial truck crops. Significant amounts of hay, small grains, soybeans, and other miscellaneous crop products were also produced. The basins farms also produced quantities of beef, veal, pork, poultry, and milk. Total cash receipts from farm production, including farm forestry, were about \$40 million. The net income was about \$9.5 million.

Highways and railroads interlace the Satilla-St. Marys basins area and provide important routes of transportation between the cities of the basins and the surrounding region.

Brunswick, as the major city within the basins, has important industrial developments and is a service center for sport fishing and ocean beach

recreation. Because it is a seaport city, it has had and will continue to have considerable influence on industrial development, particularly in the Satilla River basin. Jacksonville, Florida, a large city, on a deep-water harbor, outside the study area, has dominated and will continue to dominate the industrial development in northeast Florida. Fernandina Beach, also with a deep-water port, traditionally has depended upon the pulp and paper industries and, to a lesser degree, on the processing of seafood for its industrial employment.

Waycross is an important railroad center in the basins. Cigars, shoes, and apparel are manufactured here and the city contains food-processing, lumber, metalworks, and printing and publishing industries.

Within the basins area away from the coastal cities, the traditional industries are related to farm and forest products and to the labor supply created by declining agricultural employment. Industries utilizing forest resources are located throughout the basins. These include logging, naval-stores, sawmilling, and wood-working operations. For the most part, these are small industries employing less than 50 people each, and in many cases employing less than 25 people. The production of wood products in 1960 for the basins amounted to 76 million cubic feet with a stumpage value of \$7.6 million. In addition, 160,000 barrels of crude naval gum was produced with a value of \$6.4 million. The naval-stores industries produced

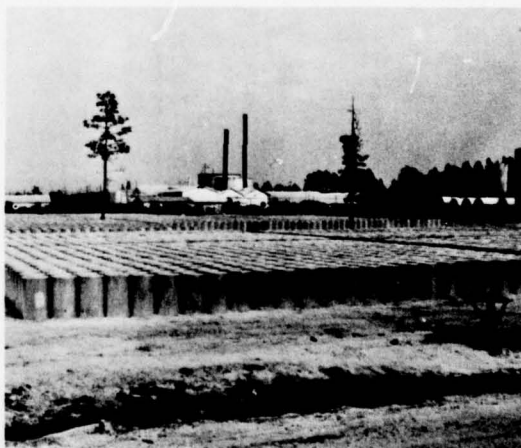


Figure 1.26 Chemical Plant, Baxley, Georgia, Producing Rosin Products. In 1960, 48 Million Pounds of Rosin Were Produced in the Basins.

1,770,000 gallons of turpentine and 48 million pounds of rosin. The local industries utilizing pulpwood are located in Brunswick and Fernandina Beach, both coastal cities.

While the existing economic development of the Satilla-St. Marys basins is considerable, it has not approached its full potential. And while the level of development is significantly below the national average and somewhat below that of the Southeast River Basins area, the existing economy forms an excellent base upon which to accelerate economic growth and development of the basins.

Future Economic Growth and Industrial Development

The future economic and social environment of an area is the most important guideline of needs, in terms of resource development and utilization. For this reason, detailed basic studies were made of the Satilla-St. Marys basins economy in relation to the regional and national economy. On the basis of these studies, projections of population, employment, and income were developed for the basins for the years 1975 and 2000, assuming favorable resource-development conditions.

The basic information used in establishing the goals for the basins is contained in an Economic Framework established for the Southeast River Basins and included in Appendix 9. It includes

projections of the important elements which are expected to shape the economy of both the Nation and area for which the comprehensive plan is designed. These social and economic elements include population, gross national product, labor force and employment, income and food and fiber requirements. The resource utilization and development needs are delineated to fit this social and economic environment and become the planning goals. The projections are not presented as precise predictions of future conditions, but are considered to be adequate as planning guides. To the extent that the projections may be too optimistic or conservative, the projected level of economic growth may be reached earlier or later, but the goals would not be greatly altered.

After the national projections had been made and production requirements established, similar projections were made for the Southeast River Basins area and each of the river basins. Needs were determined in relation to these national, area, and basins projections, physical resources, and the production requirements. Details are included in Appendix 9, Economics.

Total population is expected to increase from 165,500 in 1960, to more than 317,000 by the year 2000. Although the basins population is now approximately one-half urban and one-half rural, the urban population of the basins is expected to be over 60 percent of the total population by 1975 and over 80 percent by 2000. The Brunswick metropolitan area typifies the recent

TABLE 1.5
Production Data and Projections—Satilla-St. Marys Basins

Item	1959	1975	2000
Cotton (million pounds)	6.1	7.8	7.5
Corn (million bushels)	3.1	3.8	6.0
Peanuts (million pounds)	8.9	14.0	25.7
Tobacco (million pounds)	22.5	38.4	57.6
Commercial truck (thousand tons)	6.7	20.0	30.0
Hay (thousand tons)	11.6	18.2	27.9
Meat (million pounds)	83.1	141.1	228.0
Milk (million pounds)	59.8	103.4	159.5
Eggs (million dozen)	9.9	12.6	15.0
Timber cut (million cubic feet)	76.0	115.0	180.0
Gum naval stores (thousand barrels)	160.7	220.5	320.0
Commercial fish (million pounds)	*42.3	56.7	91.4

* Based on average annual catch 1955-59.

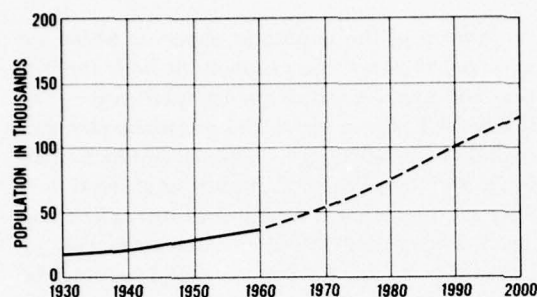


Figure 1.27 Population, Brunswick Metropolitan Area.

and expected rapid rise in urban population in industrialized areas.

Since the economy of the Satilla-St. Marys basins is related to that of the Southeast and the Nation, national trends in population, per capita income, and employment will, in part, influence trends for the basins.

The potential for the expansion of manufacturing employment is good in the basins. By 2000, manufacturing employment is expected to exceed 32,000 and amount to 26 percent of the total labor force.

The knowledge that employment in manufacturing activities helps create additional jobs for workers in trade and service occupations evokes much local and regional interest in industrial development. Many towns have an industrial-development corporation or committee of the local chamber of commerce. A few of these local groups are coordinated city-county organizations. Their work generally consists of stimulating local interest in industrial development, defining local assets and liabilities, raising money for industrial

building and loans, and visiting and negotiating with suitable industries.

The lack of economic growth in underdeveloped areas has been a problem for a long time and has been brought into sharper focus by the rapid transitions now underway throughout the national economy. For short-range planning to obtain immediate results, local resources should be examined and the possibilities for expansion under going programs determined.

The Rural Development Program was established in 1955 as an interagency effort to solve some of the economic problems of rural underdeveloped areas. This program, renamed the Rural Areas Development Program, is operating with renewed emphasis which involves cooperative efforts of many agencies, including those of the U. S. Department of Agriculture and State colleges and universities. The land-grant colleges of each of the five States of the Southeast River Basins area are active in this work. In addition, assistance is available in Georgia from Georgia Department of Commerce, Georgia Institute of Technology Engineering Experiment Station, and the University of Georgia Institute of Community and Area Development. In Florida assistance may be obtained from the Florida Development Commission.

The Area Redevelopment Act of 1961 is directed toward creating new employment opportunities through the development of facilities and resources. The program offers five broad types of assistance. These include loans, grants, technical assistance, planning, and occupational training.

Also, there is increased opportunity under the

TABLE 1.6
Economic Factors and Projections

Year and area	Population	Increase over 1960 (percent)	Employment	Increase over 1960 (percent)	Per capita income	Increase over 1960 (percent)
1960						
United States	180,000,000	---	67,000,000	---	\$2,222	---
Southeast River Basins	4,948,000	---	1,753,000	---	1,582	---
Satilla-St. Marys basins	165,500	---	60,700	---	1,378	---
1975						
United States	235,000,000	31	89,000,000	33	3,012	36
Southeast River Basins	6,408,000	30	2,343,000	34	2,202	39
Satilla-St. Marys basins	209,200	26	80,600	33	1,845	34
2000						
United States	380,000,000	111	148,000,000	121	4,733	113
Southeast River Basins	10,050,000	103	3,789,000	116	3,922	148
Satilla-St. Marys basins	317,200	92	123,800	104	3,181	131

EMPLOYMENT

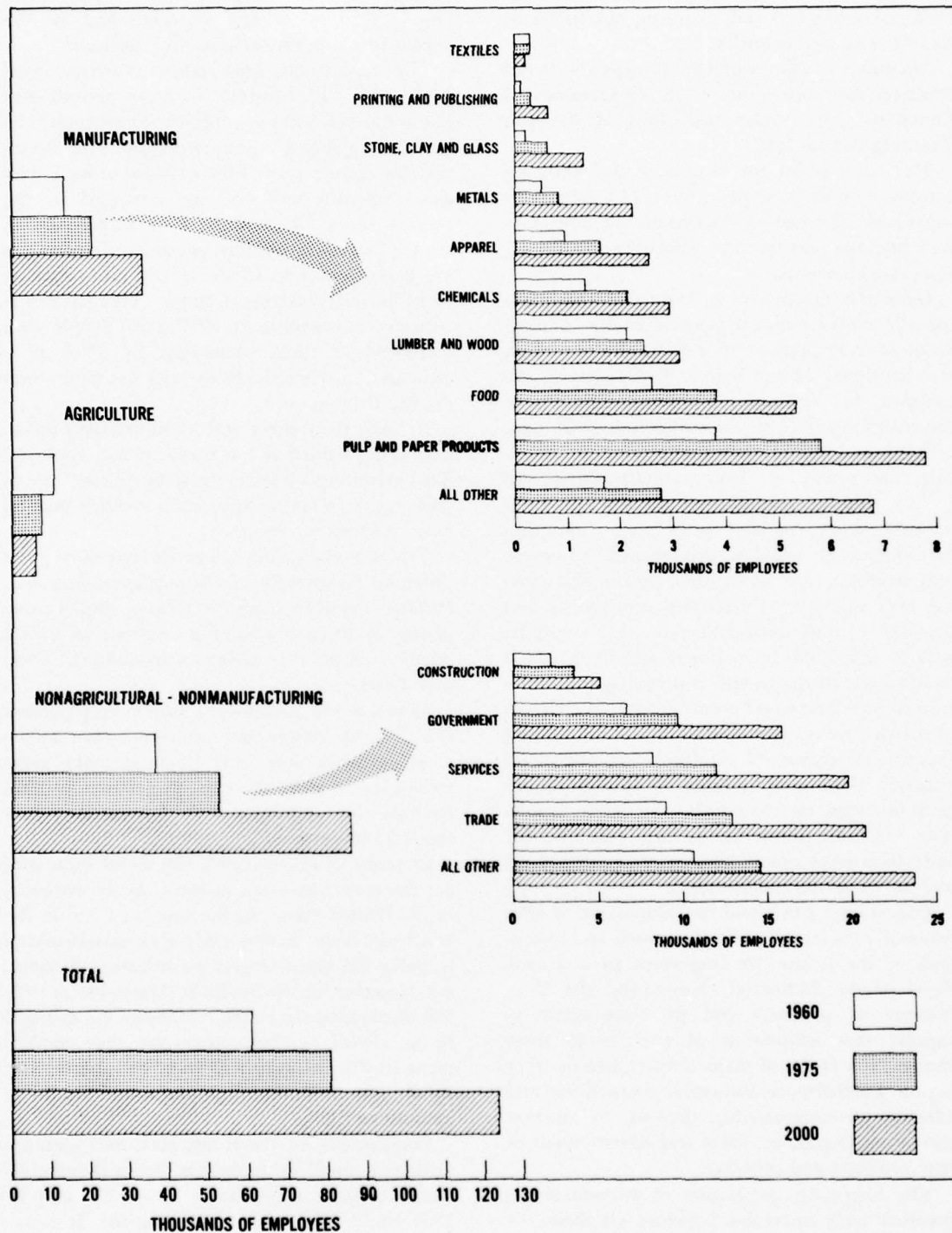


Figure 1.28

Federal Housing Act to rehabilitate blighted industrial and commercial areas and to obtain technical assistance and planning aid in cities, small towns, and counties.

Assistance is also available through the Small Business Administration, U. S. Department of Commerce, and under provisions of the Job Training Act of 1962.

The focal point for obtaining and utilizing assistance under these programs is in local groups organized effectively to delineate the community's interests and initiate action toward obtaining these objectives.

Industrial expansion in Savannah and Jacksonville would create opportunities for employment or development of satellite industries in the Satilla-St. Marys basins. Industries of importance to the basins and those that might locate or expand in the basins include petroleum refining and the manufacturing of petrochemicals; ore reduction; heavy metalworking and rolling; cement manufacturing; paper-products manufacturing; molded pulp and packaging; manufacturing wood-particle board, plywood, and sandwich-type wallboards; and manufacturing and assembly of electronic equipment and machinery. Such industrial expansion could be greatly enhanced by regional planning which would give adequate and continuing consideration to problems of economic geography, pattern of urban development, and to factors influencing location of industrial satellites and industrial clusters. These include access to markets, transport facilities, raw materials, and labor supply. The Satilla-St. Marys basins have potential for industrial development because of available land and access to navigable waters.

Educational levels and the adaptation of educational patterns to industrial needs and potentials of the future are important to economic development. Industrial change and the obsolescence of products and processes occur so rapidly that adaptation of workers to these changes is a factor of major importance in every region. Furthermore, industrial competition and effective entrepreneurship depend, to an ever increasing degree, on ideas and development of new products and processes.

The long-range projection of manufacturing involves many interrelated factors. Of these, the location of raw materials, labor force, transpor-

tation, and markets predominate. The major industries in the basins, pulp and paper, are largely oriented to raw materials and are expected to maintain their leading position.

The next most important industries, food processing, will continue to show growth and maintain their relative position. These industries have been growing rapidly throughout the Southeast and have exceeded the national growth average. Presently, seafoods are processed in the coastal cities of Brunswick and Fernandina Beach; and meat, poultry, pecans, and vegetables are being processed in the inland cities such as Douglas and Waycross, Georgia. This pattern is expected to continue. In 1960, 2,600 people were employed in these industries. By 2000, it is estimated this employment will be more than double that figure.

In 1960, the lumber and wood products industries ranked third as a manufacturing employer. This relative position is expected to continue as their employment is expected to increase steadily over the next 40 years.

Two manufacturing categories that show great potential for growth are chemicals and apparels. In fact, chemicals might very easily displace one of the top three as a leading employer as a solid missile fuel plant is under construction in Camden County.

Apparels are presently a minor employment factor in the basins, but projections of employment statistics show that it could make great strides in the next 40 years. Projections to 2000 indicate that employment in this category may reach 2,500 persons.

In terms of employment, the metal industries are the most important industry in the economy of the United States. In the Southeast and in the Southeast River Basins study area metalworking is today the third largest manufacturing industry. However, in the Satilla-St. Marys basins only 500 of the manufacturing employees are engaged in metalworking. Indications are that employment in this category will increase rapidly; and by the year 2000, the employment is expected to amount to 2,200.

Employment in the stone, clay, and glass industries is small in the basins. Presently employment in these industries is about 200 and by 2000 could amount to 1,300 persons. It is believed that the current small employment in tex-

tiles will remain or decline slightly in keeping with a national and regional trend in this manufacturing category.

There are sites near the Intracoastal Waterway all along the Atlantic coast in the Satilla-St. Marys basins which would permit protected waterway transportation to the Department of Defense installations of Cape Canaveral for the products of industries which are established in these areas. The area is attractive for industrial development because of the availability of labor, low tax rates, good weather, and closeness to deep-water ports.

The basins have three deep-water ports, and the Intracoastal Waterway traverses the coastal areas. These facilities, in conjunction with the projected increase in production, will give an impetus to the shipping and transportation industries.

Agricultural employment is expected to decline sharply although farm productivity and income per worker is expected to continue to increase. This trend is part of the general trend toward urbanization and industrialization. In 1960, 10,800 people were employed in agriculture. In 1975, employment in agriculture is expected to be 7,700 persons, and by 2000, about 6,000. In contrast to this decline, manufacturing employment is expected to increase from 13,500 people in 1960 to 20,500 persons in 1975 and 32,700 people in 2000.

Approximately 1,247,000 acres of land in the Satilla-St. Marys basins were in farms in 1959. The increase in population expected in the United States and the Southeast for 1975 and 2000 will create heavy demands for a greatly expanded food and fiber production. The Satilla-St. Marys basins will share in this increased production to the extent its agricultural resources are developed and utilized. The Satilla-St. Marys basins are expected to produce almost three times as many peanuts by the year 2000 as was produced in 1959. Projections indicate that the basins also will produce about 145 million more pounds of meat and 35 million more pounds of tobacco. These and other increased opportunities in the basins will be met with fewer farms and farm workers but with a greater total acreage of farmland than was used in the basins in 1959.

Sales of the basins agricultural products are projected to total about \$100 million by the

year 2000 as compared to about \$39 million in 1959. In order to utilize the potentials, some major adjustments in the agricultural industry will be required. Individual farms will be about 30 percent larger in acreage, and the capital investment will be more than twice the 1959 investment per farm.

Farm woodland is expected to decrease from 851,000 acres in 1959 to 601,000 acres by the year 2000. Nonfarm woodland should increase from 1,865,000 acres in 1959 to about 1,941,000 acres by the year 2000. The net effect will result in a decrease in total woodland acreages between 1959 and the year 2000. However, improved standards of woodland management on existing forest lands by the year 2000 will produce more than twice the 1959 production.

Land for service areas for towns, cities, highways, airports, and recreation required about 379,000 acres in the basins in 1959. Certain rural-residential lands, farmstead and other farmlands, and vacant and wastelands, all amounting to 19,000 acres, are also included in the preceding figure. By 2000, such uses are expected to require about 420,000 acres of land. These adjustments in total land resources of the basins, in conjunction with the increased population, will require agriculture and forestry to operate at higher levels of efficiency. It will also necessitate adequate planning of resources development to insure the best resources utilization.

Other than manufacturing and agriculture, important categories of employment in the basins include government, wholesale and retail trade, services and construction.

The requirements for employment in government including public schools are expected to increase at a slightly greater rate than the population in general. The greatest increase in this field will probably occur in education. At the same time, other segments of local, State, and Federal Governments are expected to increase. Wholesale and retail trade and services and, to some extent, construction will be influenced by the expected increase in tourist travel and the use of the recreational resources of the basins. Employment in all these nonagricultural and nonmanufacturing activities is projected to increase from 36,400 in 1960 to 52,400 in 1975 and to 85,100 by the year 2000.

Personal income is related to the size and pro-

ductivity of the labor force. The Satilla-St. Marys basins are handicapped by unemployment, underemployment, and low-pay industries. The basins lag behind the United States and the Southeast in per capita income.

Total personal income in the basins is expected to increase from about \$228 million in 1960 to about \$386 million in 1975 and to \$1,009 million in 2000. Per capita income is projected to increase about two and one-third times by 2000 and, as with the Southeast River Basins area, to move closer to the national average.

Social and Institutional Factors

Social and institutional factors affect the economic development of an area, and the rate of accomplishment of needed changes is indicative of future progress. Awareness of a lag can, and often does, provide incentive to more effective organization and action. One outcome of this awareness is the formation of local and regional

organizations for planning and development that take note of the changing patterns of population concentrations and economic opportunity.

Local and regional planning have been affected by both State and city levels. Many of the municipalities in the basins are participating in planning and development programs in an effort to promote local opportunities in terms of the basins physical and economic potentials.

An important factor in the basins which requires immediate consideration and improvement is the generally low level of education and training. This is particularly evident among the nonwhites. The problem is becoming more acute because economic advancement involves more mechanization, automation, complex record-keeping, and high-speed output. The economic history of the United States demonstrates that economic growth and development proceed more rapidly in areas where all segments of the population are adequately equipped to contribute to

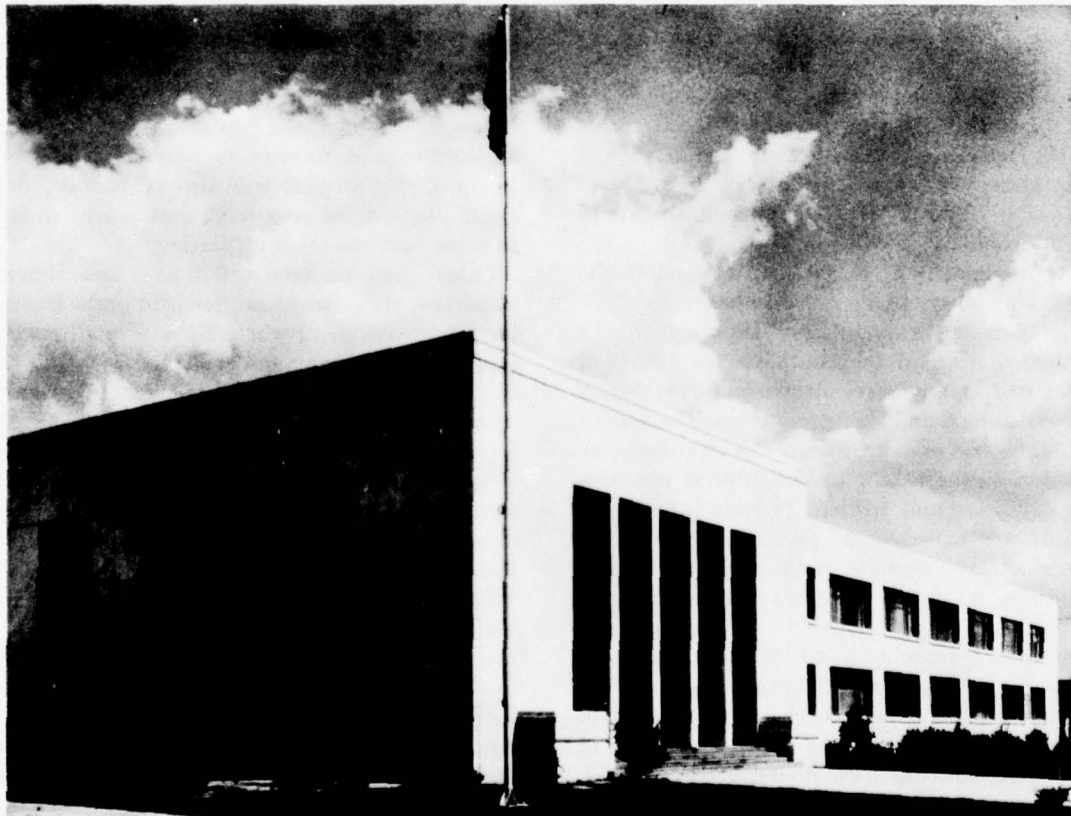


Figure 1.29 Court House, Waycross, Georgia.

and participate in the total economy.

The people in the Satilla-St. Marys basins are aware of their educational limitations and are making an effort to provide trade-school opportunities and to raise the education level. If opportunities for employment are developed in the basins to attract the youth now in school, as well as those that follow, and improvements in education and training are continued, the basins labor force would be adequately prepared to meet the demands of modern industry.

South Georgia College is located in Douglas, Georgia. A trade school is being constructed in Waycross, Georgia, with the aid of matching State funds. An extensive State school building and consolidation program has been going on in the States of Georgia and Florida for many years.

The vocational agricultural program and the various training and assistance programs related to conservation and agricultural production reach every area in the basins. Industrial training programs for workers in new industries are jointly sponsored by the States of Georgia and Florida, local interests, and the industry involved. Continuation and improvement of these programs, particularly those directly related to industrial developments, is of primary importance to the social and economic welfare of the basins.

Hospital and other medical health facilities within the basins have been improved considerably in recent years with State help and with Federal aid. Hospital services in the basins are located in the cities of Alma, Baxley, Blackshear, Brunswick, Douglas, Folkston, St. Marys, Waycross, and Woodbine in Georgia and in Callahan, Fernandina Beach, Hilliard, and Macclenny in Florida.

A general public health program is organized on a district or a county basis. Welfare departments, aided by State and Federal funds under the Social Security Act, carry on a program of aid to dependent children, the aged, disabled, and the blind.

Housing conditions in the basins are being improved, in part, by means of the low-rent public housing program which operates through local housing authorities under the Federal

Housing Act. An additional aid for local action under the Federal Housing Act is the Urban Renewal Program. Federal Housing Authority approved loans have also led to improved standards of construction and inspection of new houses and subdivisions. This is carried out with the aid of the States of Georgia and Florida and is especially important in urbanizing areas.

Federal advances and matching funds are available for planning and construction of various other kinds of community facilities. Local and regional planning programs, as outlined above, could pinpoint the needs for such facilities and the available sources for financing.

The type of local governmental structure is also an important factor in economic development. In the Satilla-St. Marys basins there are many small local government units. Many are in predominantly rural areas. This tends to limit the local government tax base and makes adequate financing of schools, medical facilities, and other social service facilities difficult. Continued progress toward more efficient and coordinated local government would contribute toward economic growth and development.

Rapid transitions within the agricultural industry have made the labor of many small farmers, tenants, and farm workers marginal in agriculture. Nonagricultural employment opportunities have not been sufficient to meet these transitions; and, as a result, there has been some outmigration from the basins. At the same time, landownership and tenancy patterns often tend to slow the rate of adjustment to more efficient and economic farming units. Although progress is being made in this field, continued improvement is essential.

Many people in the area are aware of its problems and are making efforts in the direction of planning and education. It is obvious from the income and educational levels that past efforts have not been adequate. Additional stresses on the economy will probably prevail in the future, and only through continuation and expansion of current efforts can these future problems be met successfully and the welfare of the people of the area generally improved to satisfactory levels.

PART TWO – NEEDS AND OPPORTUNITIES

General

Existing facilities and programs, needs and opportunities, and means of meeting the needs of the Satilla-St. Marys basins are discussed in this Part for each of the purposes listed in Public Law 85-850. The discussion for each purpose considers that purpose only and does not attempt to indicate or analyze its interrelationships with other purposes.

Discussion of the existing programs and facilities generally provide inventory data and briefly outline programs in which Federal and State agencies participate. Private and other public interests participate and cooperate in many of the same activities and, in addition, carry out many programs and projects not listed.

The needs and opportunities discussions point out the needs, problems, and general opportunities for meeting the needs. Potential resource development is limited by (1) the needs for each purpose geared to the number of people and the economic level of activity that are expected to prevail in the Satilla-St. Marys basins as well as

the rest of the Nation, and (2) the physical, financial, and political abilities of the basins to produce the material goods that are needed. These limits are intended to insure that excess material goods will not be produced and developments beyond the capabilities of the basins will not be proposed.

In the discussion of means of meeting the needs, the broad outline of the types of measures that probably could be effectively used is based on the assumption that available resources could be used for each purpose without regard to competition from other purposes. This was done to demonstrate what is possible in meeting the needs of each purpose and to permit treating all purposes on an equal basis when they are combined into a comprehensive plan.

Many reports on the Satilla-St. Marys basins have been prepared by Federal and State agencies and by private organizations. A summary of the more important studies are included in Appendix 12.

SECTION I – FLOOD CONTROL AND PREVENTION

General

Flood problems in the Satilla and St. Marys Rivers basins are relatively minor. The time lapse between a storm and the passage of the flood peak downstream is measured in days, and flood warnings can be effective.

Floods have occurred during every month of the year except May and November. A 27-year record of the Satilla River at Atkinson, Georgia, shows that 15 out of 28 floods occurred from January through April. A 31-year record for the St. Marys River near Macclenny, Florida, shows that 11 out of 31 floods occurred during the winter months and 18 floods occurred during the hurricane season from June through October.

The highest flood of record was that of September 1929 for the Satilla basin and that of September 1947 for the St. Marys basin. Tributaries of the Nassau River frequently overflow beyond their banks.



Figure 2.1 Satilla River, near Waycross, Georgia, at Flood Stage. Flood Problems in the Basins Are Relatively Minor.

1960

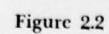


TABLE 2.1
Record of Three Highest Known Floods on the Satilla River at
Atkinson, Georgia, and on the St. Marys River
near Macclenny, Florida

River	Date of flood	Gage height (feet)	Discharge (c.f.s.)
Satilla	September 1929	27.2	110,000
	April 1948	23.9	68,100
	October 3, 1953	19.8	34,600
St. Marys	September 25, 1947	22.3	28,100
	April 3, 1948	22.0	26,600
	September 7, 1950	22.0	26,600

Existing Facilities and Programs

The U. S. Weather Bureau currently makes flood forecasts for the Satilla River at Waycross and Atkinson, Georgia. No flood forecasts are made for the St. Marys and Nassau Rivers. The reporting network, however, includes a special rainfall station at Folkston, Georgia, in the St. Marys River basin.

Two levees, adjacent to the Satilla River in Camden County, Georgia, protect two farms totaling 470 acres from high tides and river flows. The Corps of Engineers, in 1948 and 1951, did some emergency snagging and clearing on Mills Creek in the Nassau River basin to relieve flooding in the town of Callahan, Florida. Nineteen drainage projects ranging in size from 300 to 8,000 acres provide some flood protection. The regular conservation programs of the U. S. Department of Agriculture contribute to the improvement of soil hydrologic conditions and the control of erosion. Since the inception of the watershed program in 1954, to January 1, 1960, no Public Law 566 watershed projects have been approved for installation of works of improvement. However, in July 1962 and August 1962, Bishop Creek, near Baxley, Georgia, and Little Satilla Creek, respectively, totaling 137,000 acres became operational watershed projects.

Both Georgia and Florida have laws which authorize studies and planning for flood plain zoning. Federal aid to assist urban areas with comprehensive planning and zoning is also available.

Needs and Opportunities

From the Inventory of Soil and Water Conservation Needs conducted by the U. S. Department of Agriculture, watershed projects in the basins encompassing 4 million acres were considered to need project action. Project action is that cooperative action which can be effected only through formal organizations that have legal status under the State law. Planning unit watersheds and watershed projects are used synonymously.

The flood plains of the Satilla River are generally swampy and wooded and it is unlikely that they will be extensively developed for agricultural purposes. In the reach above the Pierce County line, Georgia, flood damage occurs to crops, pasture, and fishing camps. Logging-operations have also been disrupted. In the reach below the Pierce County line, little flood damage normally occurs. A 20-year frequency flood, or a repetition of the 1948 flood, would overtop levees and produce flood damage amounting to about \$14,000. Other flood damage, primarily to fishing camps, would total about \$6,700. The St. Marys River flood plain lands are used for producing pulpwood, timber, and timber products. There is no apparent need for flood prevention works on the major streams in the Satilla and St. Marys watersheds.

A flood damage survey in the St. Marys River basin completed in May 1960 found that annual flood damages resulting from floods on the main stream and tributaries of the St. Marys River were negligible.

TABLE 2.2
Flood Damages—Nassau River Watershed
(dollars)

Flood damage area	September 1950 flood damage	Average annual flood damage-1960
Nassau	1,500	500
Boggy Creek	5,000	1,500
Mills Creek	80,000	22,000
Thomas Creek	3,500	2,000
Total	90,000	26,000

The flood problems in the Nassau River basin are mainly concentrated in the headwaters of the Mills Creek drainage area. Minor flood damages occur on Boggy and Thomas Creeks, tributaries of the Nassau River. The September 1950 flood, the largest flood known, affected 25 houses in Callahan, Florida, and some agricultural land in the Mills Creek reach. It also isolated homes and caused local schools to be closed.

Means of Meeting the Needs

Consideration should be given to providing flood forecasting services in the Nassau and St. Marys River basins.

Channel improvement and floodwater-retarding structures on Mills Creek and the Nassau River could alleviate flood problems in Callahan, Florida.

Local zoning appears desirable for regulating residential and industrial development of the flood plains. Local flood problems should be brought to the attention of the people so that future buildings and improvements will not be located in the flood plains, without full recognition of the flood hazard. This subject is covered in some detail in Appendix 12, Planning.

Upstream watershed projects could provide flood prevention benefits.

SECTION II – WATER SUPPLIES

General

The development and protection of safe adequate water supplies are an important part of the public health program. The Satilla-St. Marys basins have an abundance of good water supply sources which can provide adequate water supplies for maximum development of the area. Treatment, where needed, chlorination, and continued surveillance of the public water supply by the health department is required to safeguard the water quality and public health.

The Satilla-St. Marys basins have some of the most productive artesian aquifers known. Limited amounts of ground water can also be obtained from shallow geologic formations. Ground water is of uniformly good quality, except for limited areas where the mineral content of the water exceeds drinking-water standards. The basins surface water is also consistently suitable

for municipal and industrial use and with a minimum of treatment can provide excellent water supplies.

Existing Facilities and Programs

Domestic Water Supplies

The Farmers Home Administration has a program to assist development of water supplies for groups of rural homes. Assistance is also available to municipalities from the Housing and Home Finance Agency.

Domestic water supplies are defined as private, individual supplies constructed to serve a single family. It is estimated that, in 1960, there were 14,000 domestic water supplies in the basins serving a rural population of 64,000 persons and that the average use of water, excluding water used for stock and irrigation purposes, was 50 gallons per capita per day or a total usage for

WATER SUPPLIES 1960



Figure 2.3

domestic purposes of 3.2 million gallons per day.

Of the estimated 13,800 domestic water supplies, approximately 4,700 were dug wells ranging in depth from 10 to 65 feet. An estimated 3,200 drilled wells ranged in depth from 25 to 700 feet; 2,200 bored wells had depths of from 15 to 85 feet; and 3,700 driven wells were from 9 to 126 feet deep. It was estimated that 500 rural homes had no wells and obtained their water from neighboring wells.

An estimated 75 percent of the rural water supplies had pressure systems, but only 36 percent of the systems met recommended sanitary construction standards. Approximately 6 percent of the rural supplies provided inadequate quantities of water during extended drought periods.

Municipal Water Supplies

In 1960 there were 26 communities in the Satilla-St. Marys basins with municipal water systems serving an estimated 101,300 people. The average daily water demand was about 10.5 million gallons including 800,000 gallons for two Federal installations which served an estimated 1,730 persons. The municipal water use also included 400,000 gallons per day supplied to indus-



Figure 2.4 *Safe and Adequate Water Supplies Promote Economic Development.*

tries. All of these systems were supplied from ground water sources.

The municipal wells ranged in depth from 300 to 1,205 feet. The average per capita municipal use was 95 gallons per day. In the four larger communities in the basins, the daily per capita use varied from 82 to 126 gallons.

No estimates of the total number of semipublic water supplies serving motels, State parks, and institutions such as schools, hospitals, and prisons were made. Of the 17 semipublic water supplies inventoried, the number of people served ranged from 18 to 800. The per capita use per day ranged from 8 gallons reported by a motel to 300 gallons for the Florida State Hospital, Macclenny, Florida.

The bacteriological and sanitary quality of municipal and semipublic water supplies are under the surveillance of the respective State health departments. In 1960, 19 of the municipal supplies were treated as were the supplies for the Federal installations and 3 of the semipublic supplies visited.

In some areas, the ground water contains sulfides and iron in objectionable amounts.

The surface waters of the basins were not being used in 1960 as sources of municipal supply. The quality of these waters is consistently good and, with proper treatment, could be used to supplement the ground water sources.

Industrial Water Supplies

Some of the industrial establishments located in or near municipal areas obtain their water from municipal systems. Others have developed private sources of supply. The total 1960 industrial water use was 160 million gallons a day, including approximately 400,000 gallons supplied by municipal water systems. Recirculated cooling water use was not included in these estimates.

The industrial water use is primarily nonconsumptive and nearly all of the withdrawal is discharged to the streams as industrial waste.

Needs and Opportunities

Domestic Water Supplies

Many wells are improperly sealed, uncovered, without pumps, or have pumps which are not

TABLE 2.3
Industrial Water Use in 1960¹

Industry		Process ²				Cooling			
Type and No. of plants	No. of employees	Source ³		Treatment ⁴	Average demand m.g.d.	Source		Treatment	Average demand m.g.d.
		Number	Type			Number	Type		
Chemical 6	1,213	1	S	N	0.002				
		1	W	N	0.150				
		3	W	N	24.766	3	R	N	--
		1	W	N	0.705	1	W	N	11.000
Creosoting 3	104	3	W	N	0.073				
Food 22	1,561	4	W	D	3.335	3	R	D	--
		1	M	N	0.027	1	W	N	0.390
		14	W	N	1.435	12	R	N	--
		1	W	D	0.900	1	R	N	--
		2	W	N	0.021	2	W	N	0.033
Paper 7	3,350	3	W	DH	30.555	1	R	N	--
		1	W	N	0.304	1	R	N	--
		1	W	D	10.000	1	W	D	6.000
		1	W	H	32.005	1	W	D	2.500
		1	W	H	35.000	1	R	N	--
Miscellaneous 3	1,410	1	M	N	0.067	1	S	C	0.296
		1	M	N	0.051				
		1	W	N	0.040	1	R	N	--
					139.436				
						20.219			

NOTES: ¹ Data for industries which obtain their water from municipal sources are not included.

² Drinking and boiler water included.

³ Source—M—Municipal

S—Surface

R—Recirculated

W—Private well

⁴ Treatment (all boiler water is treated)

C—Settling basins

D—Disinfection

H—Softening

N—None

self-priming. Poor construction and improper equipment affords little protection against contamination of the supply. The drilled wells generally meet sanitary construction standards and most are equipped with pressure systems.

Supplies subject to bacteriological pollution due to improper construction of the wells or handling of the water are a public health hazard. The entrance of surface runoff following heavy rains results in turbidity and carries contamination into the water supply. Some ground water supplies have objectionable amounts of sulfur, iron, and hardness, and it is possible to remove most of these undesirable characteristics.

By 1975, the average per capita use of the rural populations is expected to rise to 70 gal-

lons per day. An estimated 60,100 persons will be served by domestic water supplies in 1975 and will use 4.2 million gallons of water per day. By the year 2000 per capita water use is expected to increase to 100 gallons per day and the estimated 44,200 persons to be served by domestic water supplies will use 4.4 million gallons per day.

Municipal Water Supplies

Future water supply requirements are based on population projections and an estimated per capita per day water demand of 150 gallons in 1975 and 200 gallons in 2000.

In the coastal area excessive withdrawals from the aquifer near the coast have created problems

of salt-water intrusion. Supplementary surface water supplies might be developed for this area to supplement the ground water supply.

Several of the municipalities reported needs for improvements of their water supply systems. In addition to these apparent needs, other facilities should be enlarged.

In estimating the water supply needs, it has been assumed that the metropolitan areas of Brunswick and Waycross, Georgia, and the urban areas of Folkston and nearby Homeland, Georgia, would each be served by single water supply systems.

The municipal water facility needs do not include those for Jekyll Island, Sea Island, or the two Federal installations. It is anticipated that in 1975, 27 municipal water systems will be serving 149,100 persons and their water demands will approximate 22.4 million gallons a day. At 14 of these places new wells will be needed, at 18 places treatment will be required, and at 22 places additional storage facilities will be needed. By the year 2000, 29 municipal systems will be serving 273,000 persons and the water requirements will be about 54.7 million gallons of water per day. The water facilities required to provide adequate supplies include new wells and treatment facilities at 8 places and new elevated storage tanks at 10 places.

Industrial Water Supplies

The existing industries will grow and new industries will be developed in the Satilla-St. Marys basins. In 1960, several of the larger industries were increasing their water supplies in anticipation of future development. Estimated water requirements for the year 1975 to meet increased industrial demands are 231.6 million gallons a day. The daily industrial water demand is expected to be 329.4 million gallons by the year 2000. An abundant supply of surface and ground waters is available for continued industrial growth in the basins.

Means of Meeting the Needs

Domestic Water Supplies

All wells should be properly sealed and equipped with pressure systems. Drilled wells will usually provide better protection against

contamination than other types of wells. Shallow wells should be replaced with new drilled wells, which would obtain water from the principal aquifer for the supplies which have shortages during droughts.

Local health departments should place additional emphasis on rural water supply programs by providing information and consultation to the owners. The selection of a good source, proper construction, and the installation of good pumps will provide protection and improve the domestic water supplies. The bacteriological quality should be checked to assure safety. Without proper leadership, the upgrading of domestic water supplies will be slow.

Municipal Water Supplies

To insure that municipal water supply needs are anticipated and met, a continuous study and educational program should be employed by each municipality. This will be difficult for the smaller towns unless they employ technically trained personnel or avail themselves of the services of consultants. The potability of some supplies could be improved by treatment. All supplies should be chlorinated.

Ground waters of the basins can usually be developed more economically than other sources. Surface water supplies can be developed where the need is indicated. Municipalities must plan and provide for their own needs. Technical assistance can be obtained from Federal, State, and private sources. Consulting engineers can design facilities to meet the needs using readily available equipment and following standard waterworks practices. There are no apparent unusual supply development or treatment problems.

Industrial Water Supplies

Expansion of the facilities to provide adequate water supplies for the normal growth of existing industries and the development of new industries will be required prior to 2000. Needed facilities will include new wells, new surface water intakes, treatment plants, softening facilities, and other water-handling equipment.

There are no apparent unusual source development or water treatment problems. The industrial water needs can be met by using readily available equipment and by following standard waterworks practices.

SECTION III - NAVIGATION

General

The Atlantic Intracoastal Waterway and adjacent inshore waters and the deep-draft ports in the Satilla-St. Marys basins are important navigation facilities. There is little inland navigation. The rail and highway network connecting the interior with the ports is adequate for the transportation of most inland commerce.

Existing Facilities and Programs

The port of Brunswick, Georgia, is about 10 miles north of the mouth of the Satilla River, and the port of Fernandina Beach, Florida, is about 3 miles south of the mouth of the St. Marys River. A third harbor is the Kings Bay Terminal in Georgia which was constructed for the Army Transportation Corps in 1957. This port is about 13 miles north of Fernandina Beach. All three ports are well protected by coastal islands.

The port of Brunswick is administered by the Georgia Ports Authority, the Brunswick Port Authority, and the city of Brunswick.

The port of Fernandina Beach serves two large industrial plants and a thriving, offshore, fishing industry. The local port authority, the State Board of Pilot Commissioners, and the municipal government participate in its administration. It has a good deep-water harbor, adequate approach channels, and ample dock facilities. The port of Fernandina Beach is on the Atlantic Intracoastal Waterway, which provides a barge route used extensively by industries at the port.

The Kings Bay Army Terminal in Georgia is operated by the Blue Star Shipping Corporation under a 30-year lease from the Army Transportation Corps. The lease began in 1958.

Commerce at the three ports includes both barge and deep-draft traffic. In 1960, Brunswick, Kings Bay Army Terminal, and Fernandina Beach had port commerce totaling 787,000, 62,000, and 149,000 tons, respectively.

Brunswick's port commerce included 54 percent imports, 31 percent Intracoastal Waterway, 11 percent coastwise shipping, and 4 percent exports and local traffic. Imports were chiefly gyp-

sum rock and salt. Exports were primarily naval stores and woodpulp.

Kings Bay Army Terminal commerce in 1959 consisted of salt cake imports totaling 14 percent of the tonnage; exports of pulpwood and explosives representing 57 percent of the tonnage; and woodpulp and paper shipping, both coastwise and in the Intracoastal Waterway, totaling 29 percent of the total tonnage.

Fernandina Beach port commerce in 1960 consisted of 6 percent exports, 8 percent coastwise, and 86 percent Intracoastal Waterway, involving mostly residual fuel oil, sulfur, and woodpulp.

Intracoastal Waterway traffic is mainly commercial barge and transient pleasure craft, the latter mostly seasonal. Local fishing craft and occasionally dredges, derrick boats, and pile drivers also use the waterway. On the reach from Savannah to Fernandina Beach, commercial and



Figure 2.5 Kings Bay Army Terminal Is One of the Three Deep-Draft Ports in the Basins.

NAVIGATION

1960

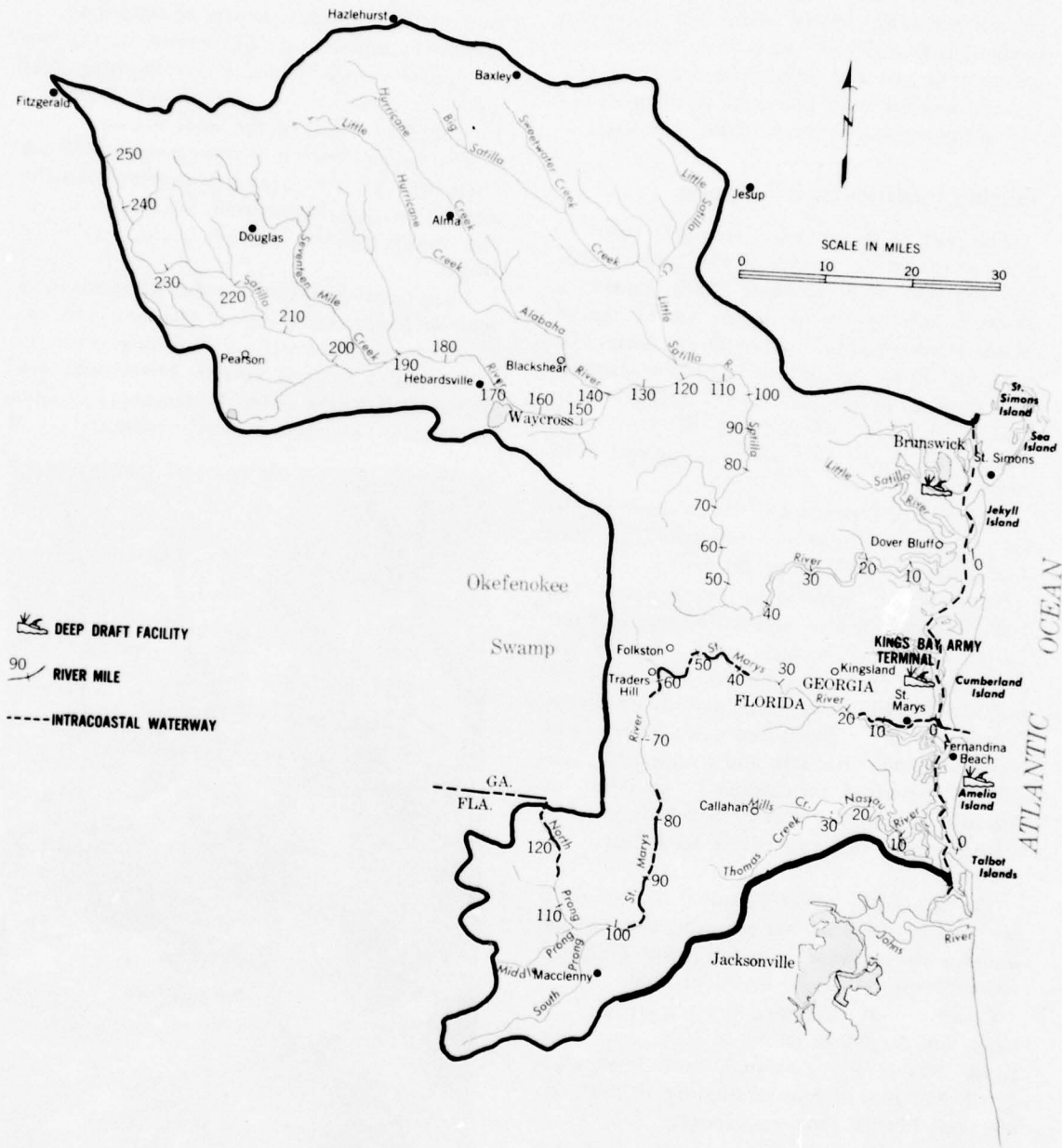


Figure 2.6

pleasure craft traffic has shown steady increases since World War II.

Navigation on the basins rivers is limited primarily to small fishing and recreational craft, except on the lower reaches. Shallow-draft facilities are scattered along the major streams. On the Satilla River there are small wharves at five main loading points, and there are numerous natural landings. On the St. Marys River there is a 50-foot, pile and timber municipal wharf at the town of St. Marys and a number of privately owned wharves and shore landings above that point. On the North River, a tidal connecting channel about 2 miles downstream from the town of St. Marys, the St. Marys Kraft Corporation owns a pile and timber wharf with a frontage of 446 feet. On the Nassau River and its tributaries, there are twelve launching ramps for trailer-transported small craft. Six of these are public facilities.

The Satilla River is considered navigable to Burnt Fort, about 50 miles from the mouth. Commerce on the Satilla River is almost entirely sand, gravel and crushed rock barged from about mile 44 to Brunswick and Jacksonville via the Intracoastal Waterway. This totaled 41,000 tons in 1960. There is no maintenance program for navigation on the Satilla River.

The St. Marys River is considered navigable to Traders Hill about 58 miles upstream from the mouth. Commerce on the St. Marys River is

confined to petroleum and a small amount of seafood products moving from Jacksonville to St. Marys. This totaled 97,000 tons in 1960. The greater part of existing traffic moves over the reach below the confluence with the North River and thence over the stream to the St. Marys Kraft Corporation mill.

Traffic on the Nassau River and its tributaries consists principally of outboard motorboats and skiffs used for cruising and sport fishing. A few shrimp boats, normally operated from Fernandina Beach, use the Nassau River for storm refuge and as a repair base. During the off season, some of these shrimp boats operate in the lower reaches of the river.

Needs and Opportunities

An analysis of commodity movements by means other than water show that about 47,000 tons, annually, on the Satilla River and 127,000 tons on the St. Marys River are now suitable for water transportation. Projected combined commodity movement is 450,000 tons in 1975 and 1,070,000 tons in 2000.

On the Nassau River, fishing and recreational craft need channel improvement to Callahan in conjunction with improvements on this river for other purposes.

Umbrella Creek at Dover Bluff, Georgia, a tidal stream that flows into Jekyll Sound, has

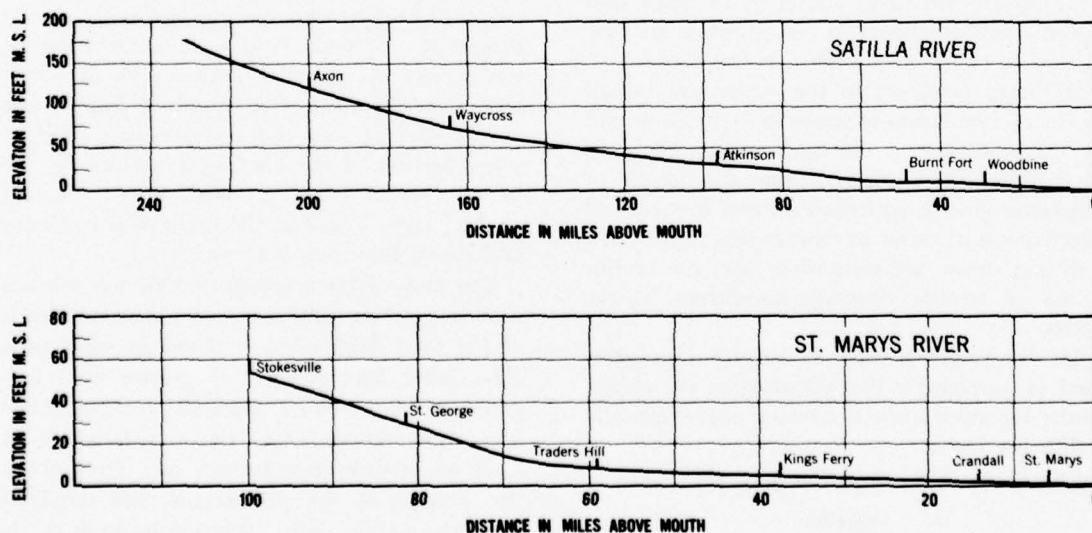


Figure 2.7 Stream Profiles.

filled with silt so that navigation on the stream is difficult, even for small craft. This is especially true at low tide. The flow in the creek is insufficient to keep the channel from filling with silt.

Projected total traffic at the ports of Fernandina Beach and Brunswick for the year 2000 are 552,000 and 1,625,000 tons, respectively. Of these, 150,000 tons at Fernandina Beach and 1,384,000 tons at Brunswick will require deep-draft facilities.

Means of Meeting the Needs

Projected traffic increases on the section of the Atlantic Intracoastal Waterway in the basins could be met by increasing and maintaining the controlling depth to permit use of the waterway by larger vessels.

For deep-draft traffic, it will be necessary to provide additional terminal facilities and improve the access from the sea at Brunswick and Fernandina Beach.

An increase in the existing 32-foot channel depth could be undertaken at Fernandina Beach.

At Brunswick, an increase in the 32-foot depth and 400-foot width of the channel over the ocean bar and the 300-foot width in the main channel and in the channels of the East River and the Turtle River would overcome probable future inadequacies.

Commerce, other than deep-draft commerce, will require additional wharves in the East River and could include special handling equipment and facilities to permit use of the wharves for barge and deep-draft traffic.

In the Nassau basin, single-purpose plans of improvement for recreational navigation were considered. These were found to be economically unjustified. Channel improvements to the upper reach of the Nassau River and up Mills Creek to the vicinity of Callahan, Florida, would serve navigation.

Corrective measures to make the former channel on Umbrella Creek at Dover Bluff, Georgia usable for navigation by small boats could be accomplished by dredging the shoals which have developed in the horseshoe-shaped reach of Umbrella Creek and providing diversion works to direct the tidal flow through the old channel.

SECTION IV – RECLAMATION, IRRIGATION, AND DRAINAGE

General

Drainage is the principal method for reclaiming land for agriculture, forestry, or other uses in the basins. Reclamation and drainage are considered as being synonymous in this Report.

Drainage problems in the basins are caused by the accumulation of water in depressions and by water tables near the land surface. Clogging of natural and artificial drains as a result of vegetative growth and siltation and the reduced effectiveness of major streams as drainage outlets resulting from sedimentation are the major causes of adverse drainage conditions in the basins.

In the humid Southeast, irrigation properly used to supplement rainfall provides the opportunity for more efficient farming operations and stabilizing income.

Existing Facilities and Programs

Irrigation

Approximately 9,700 acres in the basins were

irrigated in 1960, requiring about 8,000 acre-feet of water. Some 1,179 farms out of 6,200 farms used a total of 629 irrigation systems. The irrigation was entirely onfarm and none was by project development. Most of the onfarm acreage was served by sprinkler systems. About 8,300, 600, and 800 acres were supplied water from ponds, streams, and wells, respectively. Ninety-seven percent of the land irrigated was in the Lower Coastal Plain. In 1960, about one-half of the irrigated land in the basins was in Coffee and Pierce Counties, Georgia.

The major crop irrigated in 1960 was tobacco with more than 6,000 acres, or about two-thirds of the total irrigated area. Land in vegetables, corn, other field crops, and pasture were irrigated in about equal amounts, totaling 2,900 acres. The remainder of the area irrigated in 1960 was mainly in grass and hay. Only about 2½ percent of the pastureland and cropland was irrigated. One of the 19 counties in or partly in the basins reported no irrigation.

DRAINAGE 1960

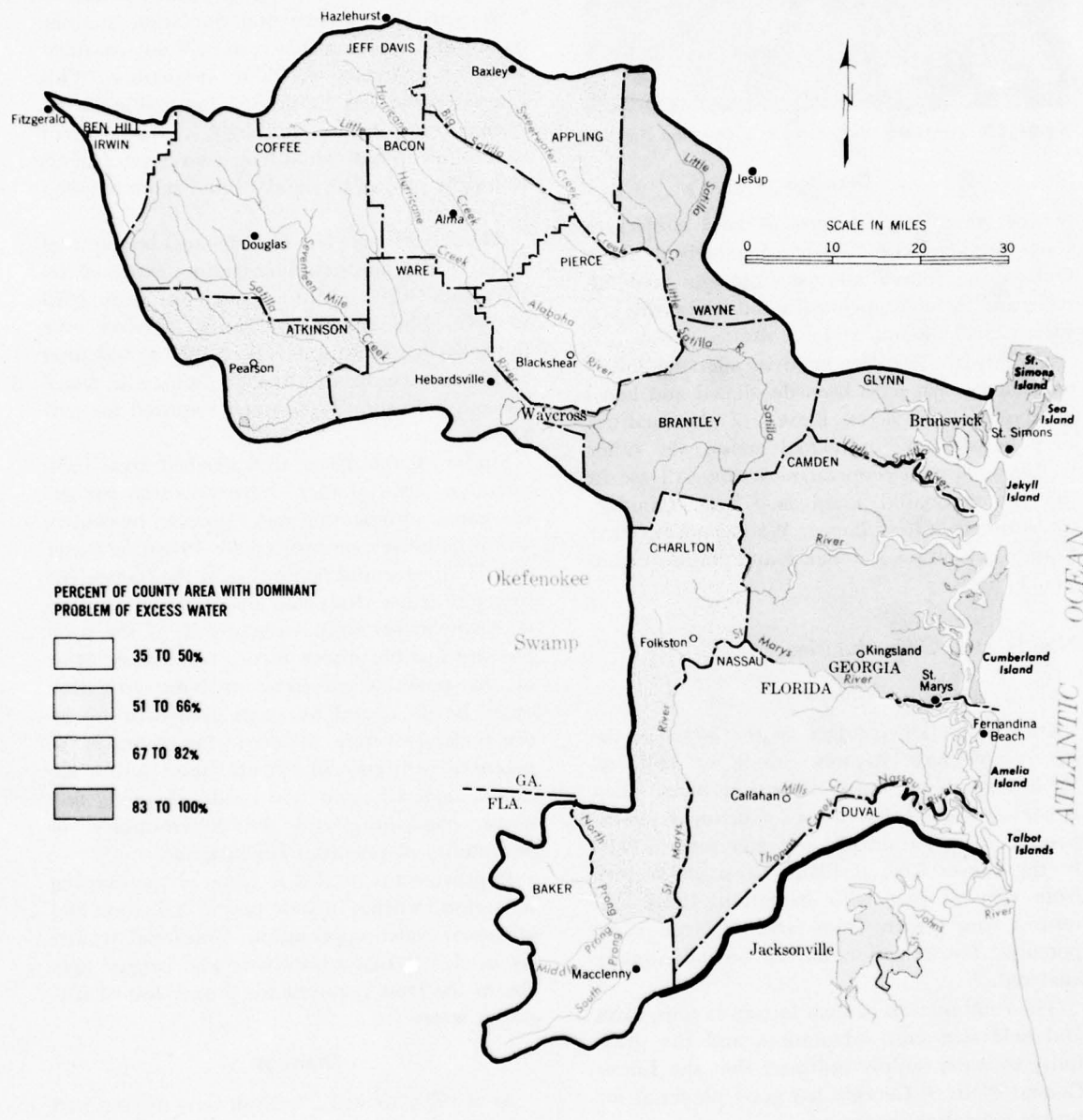


Figure 2.8



Figure 2.9 Irrigation of Tobacco Is a Common Practice.

Drainage

More than 110,000 acres of land subject to water problems are already adequately drained. Onfarm or individual-type drainage predominates and includes open-main and lateral ditches, surface field ditches, and tile drains.

Twenty-two drainage facilities affecting 500 or more acres each have been developed and benefit about 61,000 acres. Eleven of the facilities were installed by individual action, the other facilities through cooperative action. All are in the Lower Coastal Plain in Glynn, Camden, Charlton, Brantley, Pierce, Ware, and Appling Counties, Georgia, and Baker and Nassau Counties, Florida.

Needs and Opportunities

Irrigation

Only a small percentage of the farms in the basins now have streams, ponds, or wells reliable enough to supply irrigation water when it is most needed. Extensive opportunity for expansion of irrigation pits as water sources exist in the Lower Coastal Plain. Crop yields vary from year to year with irrigation. Costs and returns vary greatly from farm to farm. Farm potential for irrigation has to be individually analyzed.

The combination of such factors as soils, farm and field size, crop adaptation, and the proximity to water supply indicates that the Lower Coastal Plain of Georgia has good potential for future irrigation expansion.

There are about 1,564,000 acres of potentially irrigable land, including 434,000 acres of cropland and pastureland, in the Satilla-St. Marys

basins. If the 1954-60 trends in irrigated land use and the potential water supply, should continue, 38,000 acres might be irrigated by 1975 and more than 58,000 acres by 2000.

Irrigation included in the plan was established on the basis that incremental returns to the farmer, based on long-term projected prices, at least equal the incremental operation, maintenance, and replacements costs without consideration of secondary effects or intangibles. This general guide was considered acceptable for reconnaissance studies although it was realized that followup individual irrigation developments would be subject to standard and more detailed evaluations.

About 8,900 acre-feet of water will be required to meet the additional irrigation expected by 1975 and 16,200 additional acre-feet from 1975 to 2000. The increase of 25,100 acre-feet over the 8,000 acre-feet needed as of 1960 would total 33,100 acre-feet needed by 2000. Sources of water are ample to supply the water required for irrigation.

Studies of the upstream watershed areas indicate that some of them have potential for development of irrigation water supplies by project action. However, no projects for irrigation water supply alone would be needed in the foreseeable future. Further study and investigations will be necessary to determine conclusively if the projects are feasible under future conditions. Most of the potential projects involving irrigation could be developed by small groups or by individuals, privately financed. Development of potential projects will depend upon future national, regional, and local needs, changing economic conditions, and the determination or desirability of potential beneficiaries.

Improvements needed in some of the existing irrigation facilities include proper irrigation and improved water application. Additional studies are needed so that landowners who irrigate may obtain the facts required for proper use of irrigation water.

Drainage

As of 1959, about 2.5 million acres of land had a dominant problem of excess water. Figure 2.8 shows the extent of this problem for each county in the basins. The percentages shown on this figure indicate the proportion of each county

having significant excess water problems. Since only 110,000 acres of the 2.5 million acres of land with excess water problems have already been drained, the opportunity remains for treating nearly 2.4 million acres. Of this remaining acreage, about 1 million acres can be drained by individual onfarm drainage systems and 1.4 million acres would require project facilities.

In estimating the agricultural production which could be realized from the basins in the year 2000 without new drainage and other resource development, consideration was given to land which might be withdrawn from agricultural use for nonagricultural uses. Nonagricultural uses of land, amounting to about 379,000 acres in 1959, are projected to be about 420,000 acres, or 11 percent increase, by 2000. The reduced land available for agricultural production in these basins, as well as throughout the country, must meet the increased production projected for cropland and pasture by the year 2000. There are, therefore, extensive opportunities for additional drainage to help meet the projected production needs. For example, a significant part of the projected increased need for 2.8 million pounds of tobacco and of 2.8 million bushels of corn yields from 1960 to 2000 can be provided through drainage.

In 1958, more than 97,000 acres of the cropland had a dominant problem of unfavorable soil conditions such as low fertility, stoniness, shallowness to rock or some other condition that limits root development, or low moisture-holding capacity. By 2000, only 47,000 acres of such land will probably be used for cropland. The loss of the above 50,000 acres could be offset by draining wetlands better suited for crop production and for facilitating soil conserving adjustments in land use elsewhere. Such land use conversions and improved drainage will frequently provide opportunities for increasing income, replacing marginal farmland, and increasing the efficiency of farm operations.

Few tile drains have been installed, but if more intensive use is made of the wetland soils, additional opportunities exist for the installation of tile drains on some soil types.

Pump type drainage has a potential where gravity outlets are not available in the Lower Coastal Plain.

Woodland water control requirements are

shown in Section VII, Forest Conservation and Utilization. About 182,000 acres of wetland classed as "other" was excluded from the studies since such land will remain primarily in non-agricultural use.

Alleviation of the excess water problem on agricultural land presents an opportunity to facilitate farm operations, restore or convert water problem areas to more favorable use for wildlife, cropland or other purposes, and to increase production. If maximum production becomes necessary, drainage facilities for the removal of excess water could ultimately be provided for most of the wetland not previously drained.

Many of the facilities required to effect the drainage consist of measures now in use, with expected improvements resulting from additional experience and research.

Means of Meeting the Needs

Irrigation

The future use of irrigation is expected to meet individual farm needs and desires rather than become an extensive production practice. Irrigated acreage will be expanded as justified by agricultural production demands to the extent that such demands can be more economically met by irrigation than by other inputs. As a means of meeting the needs, acreages could be brought into the irrigation program to replace marginal farmland and to increase the efficiency of farming operations. Development of farm irrigation systems and application of water management principles and techniques to realize the full benefits of irrigation could result from private initiative and expenditures. Most of the irrigated acreages are expected to consist of scattered or isolated tracts throughout the basins. Sprinkler irrigation systems will probably be the major type of system used.

About one-third of the total water stored in the 3,113 farm ponds expected to be in the basins in 1975 and the 4,943 ponds in 2000 could be used as a source of irrigation water.

Irrigation can serve as insurance against crop losses during drought periods. This is especially important for high-value crops such as tobacco, vegetables, and specialty crops. Wisely used, irrigation can make other applied technologies more

effective and can help to stabilize returns on investments thereby contributing to the efficiency of the farm enterprise.

From the standpoint of meeting the national and Southeast River Basins area production needs, there appears to be no urgent need to promote large-scale irrigation development in the Satilla-St. Marys basins until large shifts from presently inefficient uses of other lands are made. However, local interests in some areas probably will prefer to undertake irrigation in lieu of alternative means of increasing their net returns.

Drainage

Maximum production from pastureland and cropland is not expected to be needed during the next 40 years, but drainage of lands suited to these uses can make other applied technologies more effective, thereby contributing to efficiency of the farm enterprise. Drainage facilitates land-use adjustments needed for proper development, wise use, conservation, and protection of the land resource. Thus, it can encourage farmers to devote fewer acres to crop and pasture production, enabling them to devote more lands to other purposes.

Development of farm drainage systems and farm-by-farm application of water management principles and techniques should be considered to realize the full benefits of drainage. These programs could result from private initiative and expenditures. Onfarm outlet channels, mains, laterals, and surface field ditches would continue as the major types of systems used. Drainage works required on individual farms, together with minor lateral ditches and other works required to serve a group of farms, are

generally considered a non-Federal responsibility within the financial capabilities of local interests. Additional tile mains and laterals and pumping should also be considered in applicable areas.

In addition to the individual drainage systems, multiple-purpose flood prevention and drainage projects could be used to alleviate drainage problems requiring project facilities.

The major premise on which the projected drained acres are based include: (1) Full participation by landowners who have the responsibility of deciding whether or not to drain, (2) provision for adequate outlets for all individual onfarm and small group drainage, and (3) adequate markets to handle increased production due to drainage after allowing for shifts from inefficient farming units.

Alternative plans for drainage could involve essentially a change in areas drained, or adoption of other technological improvements, or other management practices.

The existing technical and financial assistance programs of the U. S. Department of Agriculture could be utilized in the installation of drainage facilities on additional areas.

Full consideration should be given by landowners and governmental interests involved to all alternative uses before detailed plans are decided upon.

Accelerated educational services could facilitate drainage developments by making known the results of additional studies and field trials and drainage practices, methods, equipment, operations, and management.

Research findings on drainage problems and solutions could facilitate drainage developments.

SECTION V – HYDROELECTRIC POWER AND INDUSTRIAL DEVELOPMENT

General

Low-cost electric energy, an abundant supply of water, and access to the seacoast has played a vital role in the industrial development and economic changes that have occurred in the Satilla-St. Marys basins.

Industrial development in the basins has cen-

tered around forest, agricultural, and sea products. An available labor force, the raw materials, and good transportation facilities have been important factors in attracting seafood processing, pulp and paper, chemical and metal fabricating industries to the basins. Logging for pulpwood and sawlogs, gum-naval stores, and ship and boat building also are industries that

ELECTRIC POWER FACILITIES 1961

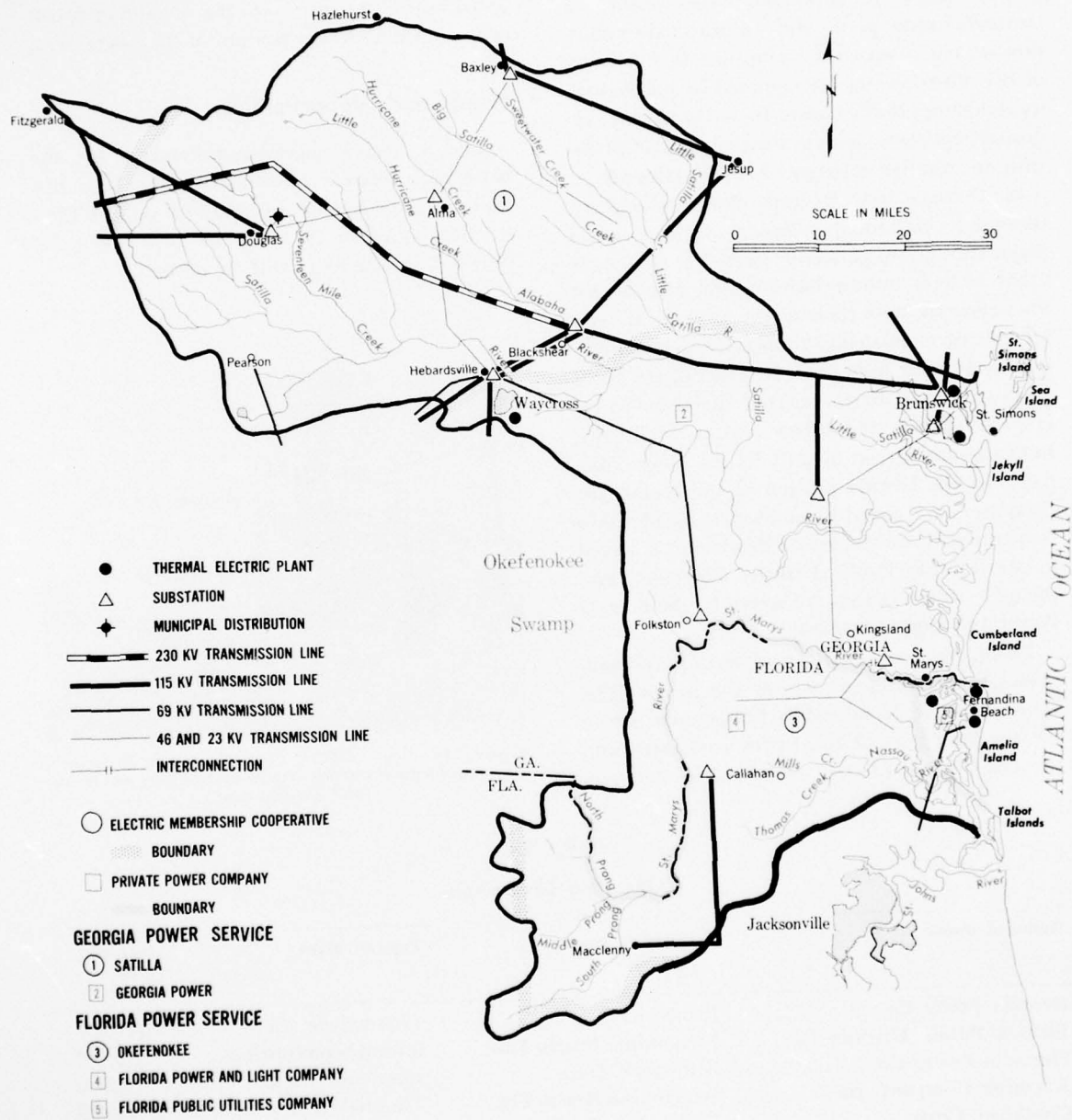


Figure 2.10

have contributed to the industrial development and should continue to contribute. A more detailed discussion of industrial development is given in Part One.

Existing Facilities and Programs

There are no hydroelectric-generating facilities located within the Satilla-St. Marys basins. A thermal-electric plant and an internal-combustion electric plant with a total installed capacity of 124,700 kilowatts are operated by public utility companies in the basins. In addition, three industrial concerns operate thermal-electric plants with an installed capacity of 36,000 kilowatts.

In Georgia, the Georgia Power Company, through its major high-voltage grid system, serves major substations generally located at the larger urban centers. Subtransmission and distribution lines emanate from these major substations, serving electric membership cooperatives, urban centers, and major industries. In general, the rural areas are served by the electric membership cooperatives while the urban centers and major industries are served directly by the power company. In the Florida portion of the basins, the rural areas are served by an electric membership cooperative; the Fernandina Beach area is served by the Florida Public Utilities Company; and the other urban centers are served by the Florida Power and Light Company.

There are two electric membership cooperatives serving customers within the basins. The Satilla Electric Membership Cooperative serves the northern part of the basins rural area and the Okfenokee Electric Membership Coopera-

tive serves the southern part including the Florida portion. In the Georgia portion of the basins, the Georgia Power Company serves all of the municipalities and urban centers with the exception of the city of Douglas. In Florida, the Florida Public Utilities Company serves the Fernandina Beach area and the Florida Power and Light Company serves the remaining urban centers in the Florida portion of the basins area.

Needs and Opportunities

The projected energy requirements for the basins is expected to increase from about 679 million kilowatt-hours in 1960 to about 2 billion kilowatt-hours by 1975 and by 2000 about 5.4 billion kilowatt-hours will be needed.

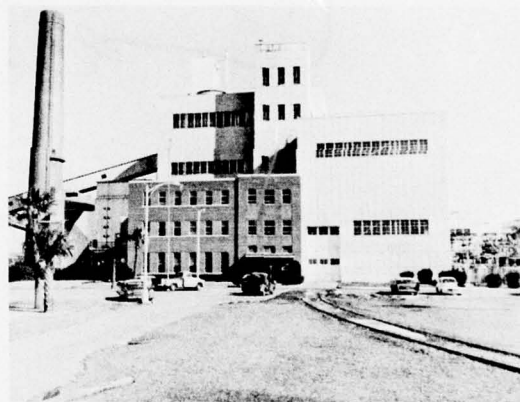


Figure 2.11 Steam Electric Powerplant near Brunswick, Georgia. Adequate Electric Power Is Necessary for Industrial Development.

TABLE 2.4
Operating Powerplants

Name of owner	Location of plant	Type of plant	Installed capacity, kilowatts
Georgia Power Co.	Brunswick, Ga.	Thermal-electric	115,000
Florida Public Utilities Co.	Fernandina Beach, Fla.	Internal-combustion	9,700
Hercules Power Co.	Brunswick, Ga.	Thermal-electric	6,000
Rayonier Company, Inc.	Fernandina Beach, Fla.	Thermal-electric	13,500
Container Corp.	Fernandina Beach, Fla.	Thermal-electric	16,500
Total installed capacity			160,700

The demand created by these energy requirements are 138,400 kilowatts for 1960 based on a 56 percent annual load factor; 405,600 kilowatts for 1975 based on a 57.5 percent load factor; and 1,030,000 kilowatts for 2000 based on a 59.5 percent load factor.

These projections reflect the population shift from rural to urban, the leveling off of residential customer use, increased commercial use, and the continuing growth of industrial development and electrical energy use.

Means of Meeting the Needs

To meet the increasing electric-power demands, the electric power utility companies could expand their generating facilities. To deliver the energy to the ultimate customer, the utility companies could extend existing lines, construct new lines, and enlarge substation capacities. To meet the growing electric power demands, the electric membership cooperatives will need to continue their programs for improving the distribution systems.

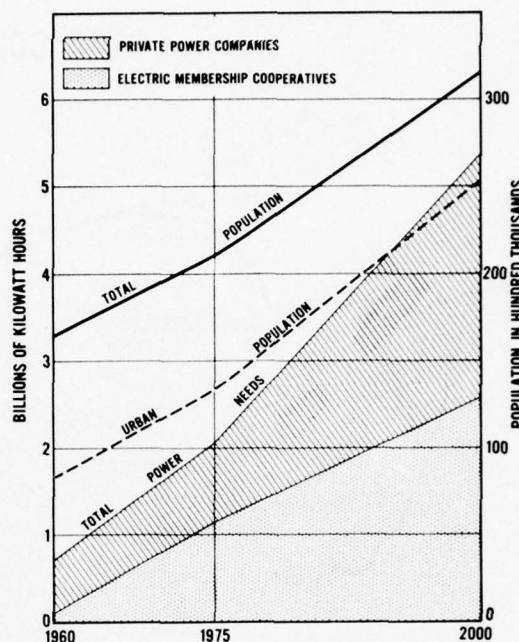


Figure 2.12 Electric Power Needs and Projected Population.

SECTION VI – SOIL CONSERVATION AND UTILIZATION

General

Soil conservation and utilization consists of both enduring and recurring or short-term practices to protect the basic land resource and to provide a stable base for permanent agriculture. Enduring conservation practices include critical area planting, land smoothing, terracing, pond construction, grassed waterways, and various types of more or less permanent plantings. Recurring conservation practices include conservation cropping systems, contour farming, and cover cropping.

This Section is largely confined to a discussion of soil conservation and utilization of cropland and pasture. Cropland includes all land reserved for crop-growing purposes; land planted to a crop that resulted in a failure; land being fallowed one season for use in a later season; or land not used in a given year, i.e., idle cropland. Pasture includes cropland pasture and other open pastureland or rangeland, but does not include woods that may be pastured.

Depth and fertility of the soil, the slope of the surface, elevation, vegetative cover, water supply, length of growing season, productivity, and the value of the land all vary widely in the basins and thus affect the utilization of the land.

From the period of colonial settlement until the 1930's, the agricultural economy of the Sattilla-St. Marys basins was based predominantly on the production of row crops principally cotton, tobacco, and corn. By the mid-1930's, this continuous row-crop agriculture had caused severe damage to the cropland through loss of the topsoil by soil erosion.

Since the 1930's, interest in conservation has grown steadily. Conversion of erodible cropland to grassland and woodland use has been most rapid in the last two decades. The process has been expedited by an economic cycle of comparatively high livestock and wood-products values and by general technical advances in agriculture practices. However, the use of land treatment practices has not been rapid enough

SOIL CONSERVATION 1960

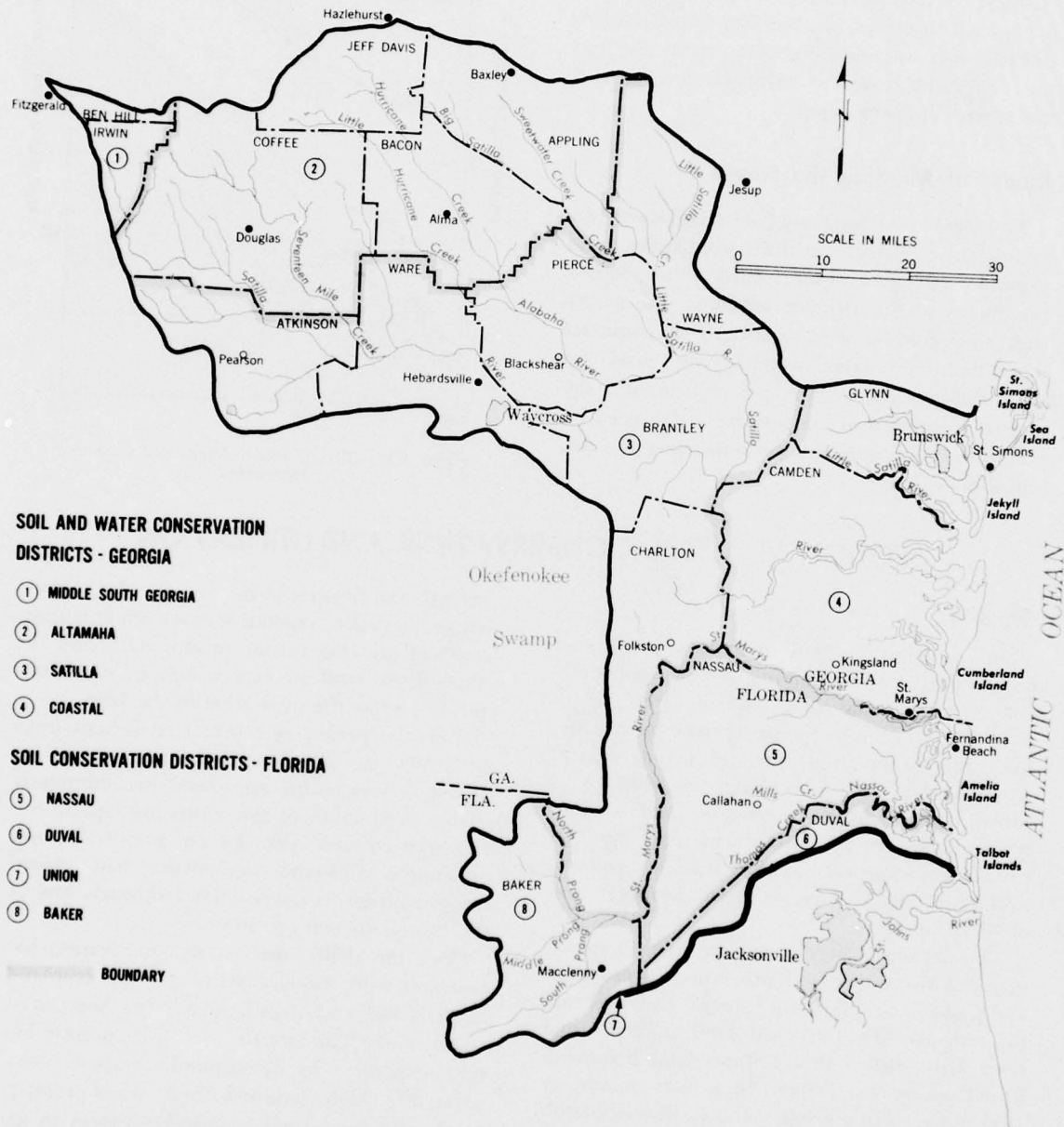


Figure 2.13

to overcome or minimize past damages and simultaneously protect the present basic land resource.

Although agricultural land use may be classified in many ways, in this Report the Land Capability Classification of the U. S. Department of Agriculture is used. Capability classification is an interpretive grouping of soils for agricultural purposes. The groupings are based on soil characteristics, the slope, and the degree of erosion. Soils in each class have limitations and management problems of about the same degree.

Classes I, II, III, and IV soils are suitable for cultivated crops, pasture, range, woodland, and wildlife. Class I soils have few limitations that restrict use. Class II soils have some limitations that reduce the choice of plants or require moderate conservation practices. Class III soils have severe limitations that reduce the choice of plants, or require special conservation practices, or both. Class IV soils, if cultivated, require careful management and are not suitable for row crops, year after year.

Classes V, VI, and VII soils normally should be used for pasture or range, for woodland, or for wildlife. Class V soils have little erosion hazard, but they have other limitations that restrict the kind of plants that can be grown and prevent normal tillage of cultivated crops. Class VI soils have severe limitations that make them unsuitable for cultivation of crops and restrict their use largely to grazing, woodland, or wildlife.

Class VIII lands have limitations that preclude their use for commercial plant production and they should be used only for recreation, wildlife, water supply, or esthetic purposes.

Existing Facilities and Programs

Erosion is a problem in some areas in the basins. As of January 1958, some 95,300 acres of cropland, about 20,600 acres of pasture, and 39,500 acres of other land had dominant erosion problems. Some 97,300 acres of cropland, 32,400 acres of pasture, and 13,700 acres of other land had dominant unfavorable soil condition problems. At the same time, some 10,400 acres of cropland, nearly 1,000 acres of pasture and about 1,700 acres of other land had no problems that limited use.

As of 1960, some 1,900 farm ponds had been constructed in the basins for single or combination use such as livestock water, irrigation water storage, fire protection, and fishing. The size of the farm ponds ranged from about 2½ acres to nearly 5 acres and totaled about 8,100 surface acres. Over 80 percent of these ponds were used for livestock water, about 70 percent for irrigation water storage, and about 60 percent provided some fishing.

In 1959, 8 percent of all land in the basins was used as cropland, 3 percent was in pasture, 78 percent was in woodland, and 11 percent was in all other uses, including cities, roads, and nonagricultural uses. About 98 percent of all cropland was in Land Capability Classes I through IV. Most of the remaining cropland was in Land Capability Class V. Less than 1 percent of all land in the basins is in Land Capability Class I. The remainder of the land has some restrictions in use and normally has some erosion, unfavorable soil or water problems.

Several major State and Federal soil and water conservation and utilization programs are in

TABLE 2.5
Distribution of Land Use by
Land Capability Classification—1958
(percent)

Land use	Land Capability Classification								Total
	I	II	III	IV	V	VI	VII	VIII	
Crop	3.0	58.4	29.8	6.5	1.9	0.1	0.3	0.0	100
Pasture	1.0	42.0	37.0	10.1	9.0	0.2	0.7	0.0	100
Forest	0.0	8.0	23.8	5.7	41.5	0.2	20.6	0.2	100
Other	0.3	6.1	11.7	3.8	4.2	0.3	73.4	0.2	100
Basins average	0.5	15.0	24.2	5.8	33.4	0.2	20.7	0.2	100

operation in the basins. These programs provide cost sharing, credit, technical assistance, and education and information services.

The eight soil and water conservation districts wholly or partly in the basins are under State charter and coordinate various kinds of State and Federal aid that are available to farmers. Many private organizations and groups make their services available to the farm operator in these districts.

As of January 1960, 12 applications for assistance in the development of watershed areas had been made under the authority of the Watershed Protection and Flood Prevention Act, Public Law 566, 10 in Georgia and 2 in Florida. Little Satilla Creek watershed, 109,500 acres, in Appling and Wayne Counties and the 27,500-acre Bishop Creek Watershed in Appling and Jeff Davis Counties all in Georgia, became operational projects in 1962. One Florida project, Mills Creek, with 39,680 acres has been approved and another, the St. Marys tributaries project, with 191,000 acres, has been determined to be not feasible.

The competition on agricultural land uses in the Satilla-St. Marys basins is increasing due to

expansion of nonagricultural uses such as urban and built-up areas, industrial areas, and highways. Acreages in strip mining and related occupations are not great in the basins now.

Needs and Opportunities

In 1959, the land area of the basins totaled 3,472,000 acres. Of this some 3,093,000 acres were used in the production of agricultural products, including forest products. By the year 2000, an estimated 3,007,000 acres will be available for agricultural production. This amounts to a 2.5 percent reduction in the land base available. The 86,000 acres in the basins that will be lost to agriculture will be used for urban and industrial growth, highways, airports, water development, and to supply other needs of a growing population. This trend is typical of the whole country. To meet the estimated food and fiber requirements by the year 2000, agricultural production must double and there will be a need for some resource development and more efficient land use. Essential elements of resource development include improved levels of management, the use of conservation practices, and the adoption of technological improvements.

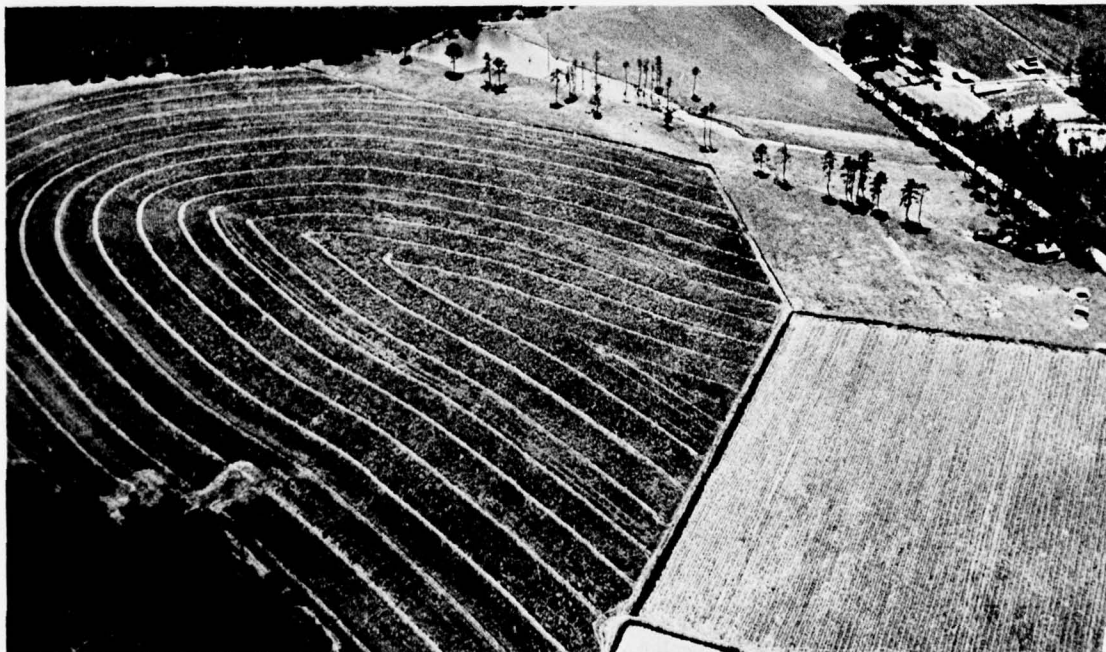


Figure 2.14 Good Soil and Conservation and Utilization Practices Increase Crop Yields and Preserve Our Basic Land Resources.

Row crop acreages in the future may decrease slightly, but livestock numbers and pasture acreages may increase. Some 377,000 acres were in cropland and pasture in 1959. By 2000, 465,000 acres are expected to be used as cropland and pastureland. This will increase the needs for conservation treatment of open land. By the year 2000, some 237,700 acres of cropland and pastureland, out of 465,000 acres in use, are expected to be in need of conservation treatment. Some 51 percent of all cropland and pastureland are expected to be in need of conservation treatment.

By 2000, it is expected that 46,700 acres of cropland will need treatment because of erosion problems. In addition, 47,000 acres of cropland are expected to need treatment because of an unfavorable soil condition. Some 144,000 acres of pastureland and rangeland are expected to need conservation treatment. Some of the treatments expected to be needed for pasture and range by the year 2000 are as follows.

TABLE 2.6
Treatment Needed for Pasture and Range by 2000
(thousands of acres)

Treatment or control needed	Area
Establish or reestablish vegetation	70.0
Reduce overgrazing	26.0
Improve vegetative cover	62.0
Protect from fire	17.0
Erosion problems	2.0
Rodent control	0.2
Noxious plant control	19.0

Some of the above treatment or control measures may be expected to be applied on the same acreage. Solutions include management of soil, water, livestock, and vegetation.

Additional farm ponds will be needed in the basins to provide water for livestock and irrigation as part of the conservation needs of many farms. By 2000, the number of farm ponds should increase to almost 5,000. This could add some 12,600 acres of additional water surface on farms.

Land conversion, or the shift in type of land use, will be a continuous process in the basins. About 8,000 acres in Land Capability Classes V to VII were cropped in 1959. Most of this acreage will likely shift to other land uses. Other

shifts will be needed to replace land lost to urban growth and development. By 2000, some 85,000 acres of land now in pasture, woods, and other uses will need to be converted to cropland. Also, about 98,000 acres of cropland, woodland, and other land will need to shift to pasture and range.

Data on woodland needing conservation treatment are included in Section VII, Forest Conservation and Utilization.

Only 5,800 acres of land classed as "other" will need conservation treatment for erosion and unfavorable soil condition problems in 2000. Most of this will be for nonagricultural purposes and due to the small acreage and individual problems presented by the areas of other land, these areas were not included in the plan.

Means of Meeting the Needs

Installation of conservation measures will depend on the changing need for agricultural products, general economic conditions, and future policies of Federal, State, and local agencies.

To accomplish the land-use changes and meet the needs for conservation treatment indicated in the foregoing sections, sound soil and water conservation practices or treatment, and high-level management will be necessary. The systematic use of gainful soil and water conservation techniques should be encouraged to avoid costly losses of the soil resource and develop the lands for future uses, to provide efficient and continuing production of food and fiber, and to improve watersheds and water resources for both agricultural and urban uses.

The necessary measures include the intensity of land treatment needed for all lands used primarily for crop and pasture production. These measures also include cultural practices on all lands currently irrigated or drained. The following measures, excluding forest conservation measures, are essential to attain a satisfactory level of protection for cropland, pasture, and range. Most are not satisfactory land treatment measures when applied singly, in improper combination, in insufficient intensity, or to wrong land uses.

To meet the cropland conservation treatment needs, high-level management should include the following: (1) Proper choice and rotation

of crops; (2) control of excess water with drainage, vegetated waterways, contour operations, and structures; (3) use of correct amounts of commercial fertilizer, lime, and manure; (4) maintenance of organic matter at high levels; (5) improvement and maintenance of soil productivity and workability; (6) conservation of soil materials, plant nutrients, and soil moisture; (7) selection of proper planting and seeding times; (8) improved tillage methods; (9) control of weeds, insects, and plant diseases; (10) proper combinations of soil and water conservation practices and measures; and (11) farm ponds.

For pasture, high-level management includes management of soil, livestock, and vegetation. Soil management includes the application of lime, nitrogen, phosphate, potash, and other nutrients in the amounts determined by soil tests. The nutrients should be applied in sufficient quantities for pasture plants to grow enough to cover and protect the soil and provide for livestock forage. The number of livestock and the grazing period should be regulated so that the pasture plants can grow vigorously during the grazing season. Vegetative management should include proper mowing, the use of chemicals for weed and brush control, and the protection of the area from fire. Water management should include an adequate number of properly distributed farm ponds.

The soil conservation and utilization of cropland, pasture, and range is based substantially

on continuation of the 1960 degree of development. Comprehensive soil conservation and utilization programs covering large areas with many variations in conditions and involving all types of landownership and management cannot be expected to be applied in their entirety. In many cases, technical assistance is limited to planning assistance only, and the establishment of practices is carried out by the farmer himself, or with assistance from other agencies or organizations.

Increased emphasis should be given annually to designing financial assistance programs to encourage those conservation practices which provide the most enduring conservation benefits practicably attainable on lands where they are to be applied.

The Watershed Protection and Flood Prevention Act, Public Law 566, as amended, makes it possible to meet many soil and water conservation needs that cannot be met under other programs. Project action under this program would help to stabilize critical areas or provide protection to the watershed area, as well as the planned works of improvement. Needed land treatment measures should continue to be applied farm by farm on those undergoing agricultural and conservation programs. Accelerated land treatment and stabilization of critical areas may best be undertaken under the provisions of Public Law 566, where such action is needed by the local people to help solve the problem in designated watersheds.

SECTION VII - FOREST CONSERVATION AND UTILIZATION

General

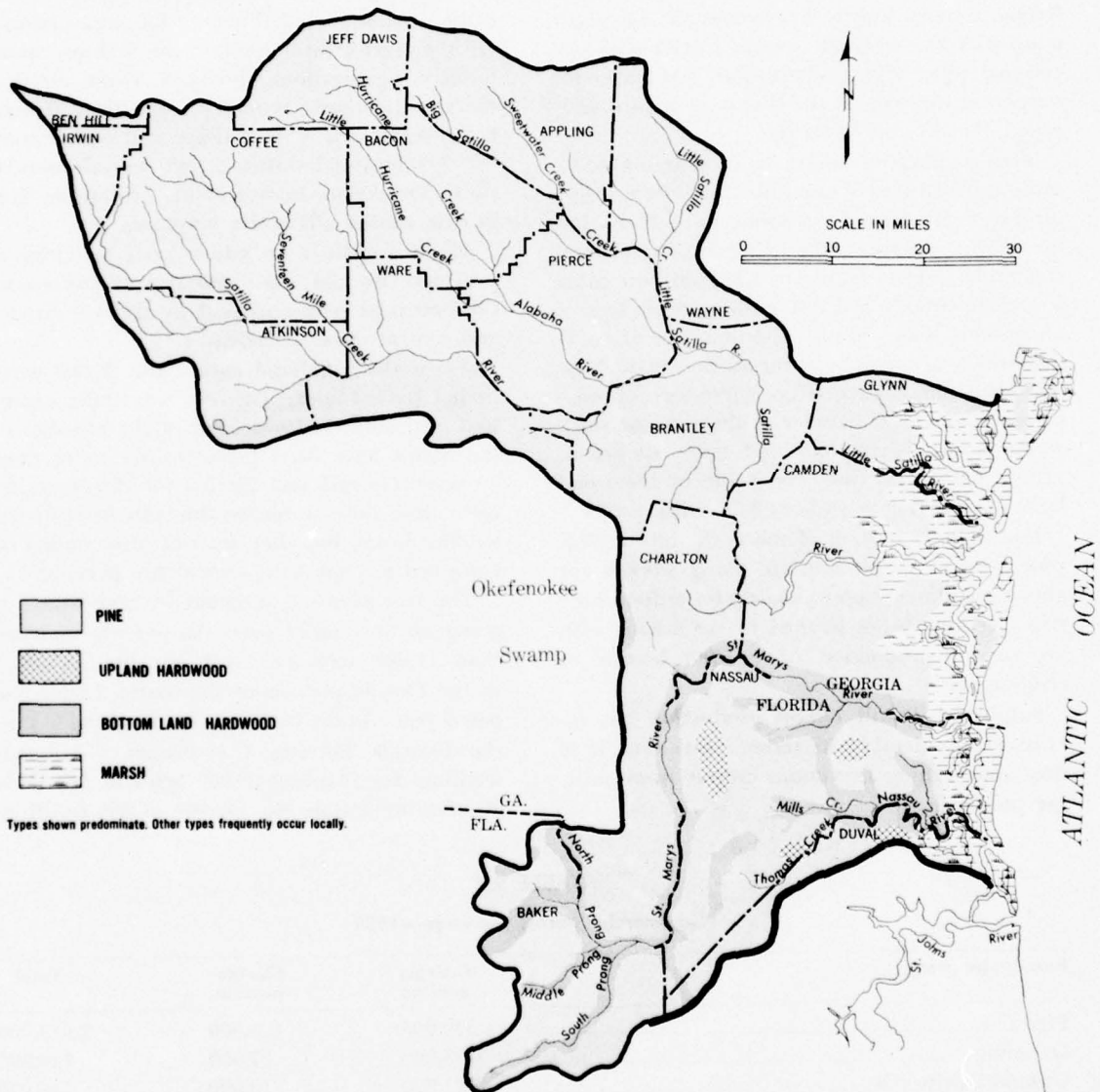
Forest lands, including pastured and nonpastured farm woodland and nonfarm woodland, occupy 2,716,000 acres, or 78 percent of the basins land area. About 90 percent of the land area in Florida is in forest cover as compared to 75 percent in the Georgia portion of the basins.

Existing Facilities and Programs

Some 2,710,000 acres are commercial forests and the remaining 6,000 acres of forest land are classed as noncommercial. There are approximately 51,000 acres of commercial forest land in Federal ownership including 47,600 acres in the

Osceola National Forest in Florida and 3,400 acres in other Federal holdings. Public non-Federal ownerships total 26,400 acres of commercial forest lands; including 20,000 acres in the Waycross State Forest administered by the Georgia Forestry Commission, 3,400 acres in the Cary State Forest owned and operated by the Florida Board of Forestry, and 3,000 acres of other State forest land. The remaining 2,632,600 acres of commercial forest land are privately owned of which 878,100 acres are owned or under long-term leases by pulp and paper companies, 857,900 acres are part of farm enterprises, and 896,600 are held by nonresident owners.

FORESTRY 1960



Types shown predominate. Other types frequently occur locally.

Figure 2.15

Four major forest-type groups are found in the basins.

Pine forests make up about two-thirds of the forest area with longleaf and slash pines being the principal species. Bottom land hardwoods, the next most dominant type group, are normally confined to areas bordering major rivers and tributaries. Principal species in this group are black gum, cypress, ash, maple, and oaks. Oak-pine types, found scattered throughout the basins, contain mostly hardwoods of the sweet gum, hickory, and oak species mixed with occasional pine. Upland-hardwoods type, also interspersed throughout the basins, is mainly composed of oaks and hickories.

The commercial forest land contains 4,793 million board feet of sawtimber, including 3,801 million board feet of softwoods and 992 million board feet of hardwoods. In terms of total merchantable timber, there are 1,354 million cubic feet of softwoods and 394 million cubic feet of hardwoods. Some 76 million cubic feet of growing stock was cut in 1959 for all products. Pulpwood was the major product harvested, followed by sawlogs. The remainder of the growing stock was cut into barrel logs and bolts, fuelwood, piling, posts, and ties. The value of the wood before harvesting was about \$7.6 million.

Less than 15 percent of the slash and longleaf pine trees of usable size are being worked for gum-naval stores. Approximately 6.4 million pine tree faces are being worked in the basins with an annual production of 160,700 barrels of crude gum.

Sulphate-pulpmill tall-oil production has increased considerably in recent years, but it is now approaching maximum output from existing pulpmills.

There are a number of active programs for improving forestry practices and yields in the basins. The States of Georgia and Florida are accelerating their programs for management assistance, and more landowners are being interested in improving their woodland. In addition, industry and consulting foresters are helping interested landowners improve their forest lands.

Both public and private organizations support research that relates to forest problems and needs of the basins. Included among the organizations are the Agricultural Experiment Stations, State forestry organizations, the U. S. Forest Service, the Georgia Forest Research Council at Macon, Georgia, various State colleges and universities, the wood-using industries, and several foundations. Protection, management, utilization, and genetic studies all receive emphasis.

Major emphasis on educational activities is provided by the State forestry organizations through field personnel and by trained district and central office specialists.

All of the woodland except the 98,000 acres in Jeff Davis County, Georgia, was under organized protection in 1960. Most of the counties in the basins have been protected for more than 10 years. Georgia and Florida forestry organizations have done a remarkable job in reducing wildfire losses, but they are not fully staffed or equipped to cope with critical fire periods.

The tree planting program in both States is going on at a rapid pace. An average of more than 11,000 acres per year has been planted in the Florida portion of the basins during the past 5 years. In the Georgia portion of the basins, the Georgia Forestry Commission distributed seedlings for planting 69,000 acres in the 1959-60 planting season. An average of 800 seedlings

TABLE 2.7
Commercial Forest Acreage—1959

Forest-type group	Georgia portion	Florida portion	Total
Pine	1,519,000	429,000	1,948,000
Oak-pine	103,000	27,000	130,000
Upland hardwoods	121,000	19,000	140,000
Bottom land hardwoods	326,000	166,000	492,000
Total	2,069,000	641,000	2,710,000



Figure 2.16 Fire Lanes Supplement Other Forestry Conservation Practices.

is being planted per acre although planting prescriptions range from 600 to 1,200 trees per acre. Over 97 percent of all seedlings planted were slash pine. Other species included loblolly and longleaf pine and yellow poplar.

The Naval Stores Conservation Program is administered by the U. S. Forest Service for the Agricultural Stabilization and Conservation Service. The Service provides conservation payments for carrying out certain approved forestry practices on the land. Of the 979 producers in the basins, some 640 are enlisted in the Naval Stores Conservation Program and work 5.4 million of the 6.4 million acres now treated for gum-naval stores production.

There have been no recent major epidemics of insects or diseases in the woodlands of the basins, although there is an ever present danger. Field technicians of the State and Federal forest

services help detect outbreaks and report them for appropriate action.

Needs and Opportunities

In view of projected increases in population, income, and gross national product, it is estimated that by the year 2000 approximately 180 million cubic feet of growing stock will be needed from the Satilla-St. Marys basins. The basins contain some of the best wood growing sites in the Nation and can produce the required amount of wood for harvest.

Gum-naval stores production of 1959 will have to be doubled by the year 2000 to maintain present total output of naval-stores products. Enough slash pine and longleaf pine trees of a suitable size will be available for this production.

Means of Meeting the Needs

Improved practices and coordinated individual and community efforts will be essential to the production program. This can be done without major legislative or ownership changes even though small decline in woodland acreages is predicted for the year 2000.

Forest management and protection programs must be accelerated on all forest lands. Programs for the next 40 years should include intensified forest fire protection for lands already under protection; inclusion of Jeff Davis County, Georgia, into the organized protective network; strengthening of forest insect and disease detection and control programs; fencing for woodland grazing control; tree planting; site preparation for natural regenerating of trees; timber-stand improvement work either in conjunction with

TABLE 2.8
Forest Production and Value

Item	Unit	1959	1975	2000
Growing stock, annual cut	cu. ft.	76,000,000	115,000,000	180,000,000
Stumpage value	dollar	7,600,000	11,500,000	18,000,000
Gum-naval stores	bbl.	160,700	220,500	320,000
Net leasing value of naval stores	dollar	1,300,000	1,800,000	2,600,000



Figure 2.17 Chipping Slash Pine for Gum-Naval Stores Products.

tree planting or as a separate measure; establishment of shelterbelts; woodland water control and management; improved naval-stores prac-

tices; more adequate programs for forest credit and insurance; and intensified educational and management assistance programs.

SECTION VIII – FISH AND WILDLIFE

General

Fish and wildlife resources have contributed much toward meeting certain needs for food and for hunting and fishing activities of the people residing in and outside the Satilla-St. Marys basins. The abundant marine life helped early

coastal settlements prosper, while the game and fish of the land and fresh waters furnished food and furs to traders and inland settlers. Traditions of hunting and fishing constitute a vital part of the recreational life of the people, and commercial fishing is still a source of livelihood

FISH AND WILDLIFE 1960

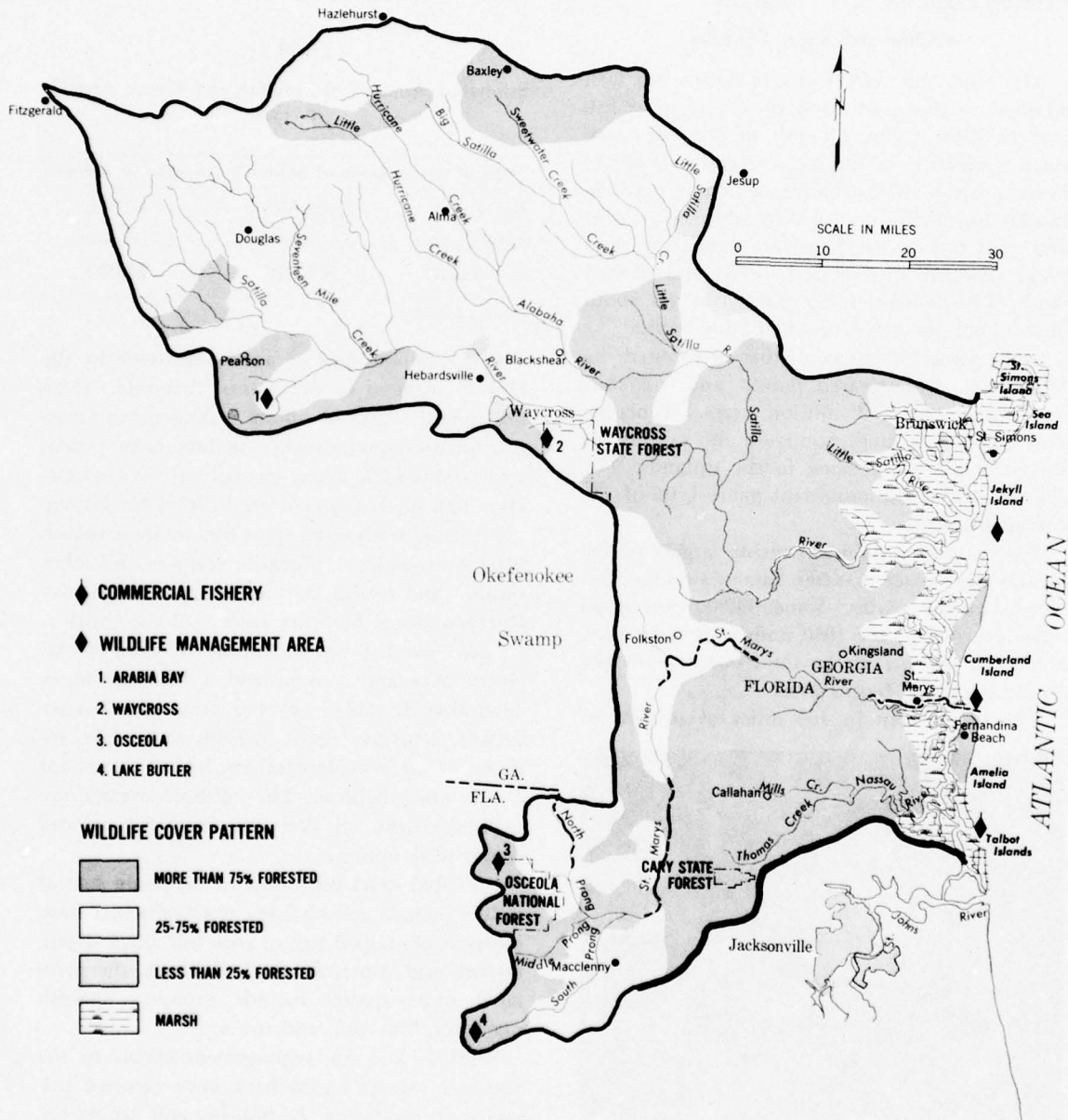


Figure 2.18

to people residing along the coast and near the mouths of the rivers. The future role of fish and wildlife resources will depend, to a large degree, on the extent to which their conservation and utilization are fitted into the economic development of the basins.

Existing Facilities and Programs

Wildlife and Sport Fisheries

The land and waters of the basins are well adapted to the production of a variety of fish and wildlife. About 2.5 million acres are considered suitable for big game. Nearly all of the lower portion of the basins, which is predominantly forested, is occupied by white-tailed deer and wild turkey. Big game are extending their range into the interspersed forests and cleared lands. The density of big game averages about one animal per 140 acres of suitable habitat.

Small game habitat consisting of forested, interspersed, and cleared lands and marshes, amounts to some 3 million acres. Mourning doves, bobwhite quail, squirrels, and rabbits are the principal small game in the uplands. The clapper rail is the dominant game bird of the coastal marshes.

The waterfowl habitat consists largely of the coastal fresh-water marshes, inland swamps, and wooded flood plains. Some 14,000 waterfowl were recorded in the 1960 midwinter inventory, about 7.2 percent of the total observed in the Southeast River Basins area.

The basins contain 400 miles of streams of

significance to sport fishing. The Satilla and the St. Marys Rivers are typical black-water streams originating in wooded swamps and bayheads of the Coastal Plain. The Nassau River is a sluggish tidal estuary throughout most of its length. The value of the Nassau River as a habitat for fish is rated low; the other streams range from moderate to high in value.

TABLE 2.9

Estimated Amount of Habitat and Game Animals in 1960

Type of game	Acres of habitat*	Number of animals
Big game	2,526,000	18,000
Small game	3,444,000	1,780,000
Waterfowl	464,000	14,000

* Not additive.

Large impoundments are nonexistent in the Florida segment of the basins. Privately owned mill ponds aggregate about 2,000 acres in Georgia. Small impoundments, mainly farm ponds, total about 8,000 acres, virtually all in Georgia. Over half of these ponds are utilized for fishing.

Principal fresh-water sport fish are large-mouth black bass, pickerel, bluegills, crappies and other sunfish, and catfish. Salt-water species also may be taken along the lower reaches of the rivers.

The coastal waters including the tidal creeks, rivers, bays and sounds, and a band of water extending 12 miles seaward from the barrier islands, comprise about 560,000 acres. The in-shore waters provide excellent nursery areas for finfish and shellfish. The offshore waters are utilized chiefly for deep sea sport fishing and commercial fishing.

Principal sport fish taken in the shore coastal waters include speckled sea trout, channel bass, sheepshead, striped bass or rock fish, black drum, tarpon, and American shad. Offshore, the principal sport species include grouper, Spanish mackerel, blue fish, and cobia.

Wildlife and fish management efforts in the Satilla-St. Marys basins have been directed primarily to increasing the hunting and fishing opportunity and preserving unique forms of wildlife and wildlife habitat.

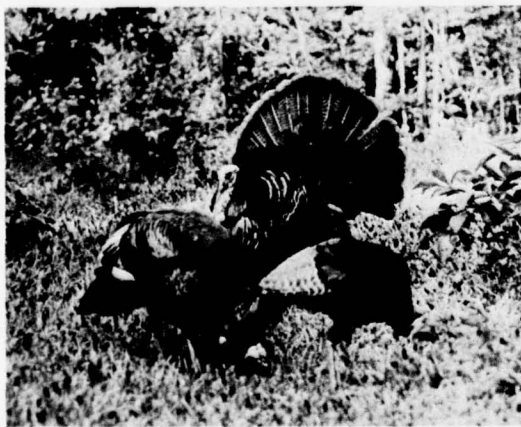


Figure 2.19 Wild Turkey—About 2.5 Million Acres in the Basins Are Suitable for Big Game Production.

TABLE 2.10
Fish and Wildlife Areas and Installations

Name and location of area	Acreage and ownership in basins		
	Federal	Public Non-Federal	Private
Kings Bay Loading Terminal, Georgia	5,000		
Osceola National Forest, Florida	47,600		
Waycross State Forest, Georgia		*20,000	
Baxley State Forest, Georgia		1,000	
Cary State Forest, Florida		3,400	
Arabia Bay Wildlife Management Area, Georgia			*3,000
Lake Butler Wildlife Management Area, Florida			*20,000
Osceola Wildlife Management Area, Florida	* (Included in Osceola Nat. Forest)		
Total	52,600	24,400	23,000

* Wildlife resources managed by State Game and Fish Department.

Primary responsibility for administering the fish and wildlife resources resides with the State game and fish departments of Georgia and Florida. Federal agencies cooperating with the State conservation agencies include the Bureau of Sport Fisheries and Wildlife, Bureau of Commercial Fisheries, Soil Conservation Service, U. S. Forest Service, and the Department of the Army.

Publicly managed wildlife areas of major importance total about 100,000 acres or about 3 percent of the wildlife habitat in the basins. The Osceola National Forest, Florida, with 47,600 acres in the basins, is the largest single tract of land where wildlife resources are managed intensively for public hunting purposes.

Habitat improvement and public hunts are carried on in the State wildlife management areas. Both Georgia and Florida have farm game programs which encourage and aid farmers in managing wildlife resources on their lands. Fishery management has been concerned largely with technical advice, renovation, and restocking of natural lakes and farm ponds. Florida has an active program of public access development. Law enforcement and information-education programs are important facets of State and Federal activity.

Commercial Fisheries

Commercial fishing is an important coastal enterprise of this area. The average annual catch from 1955 to 1959 was over 42 million pounds worth more than \$1.5 million to the fishermen. Industrial fish constituted 81 percent of the total

catch by weight and 22 percent of the total value. The principal seafoods are shrimp and crabs which are processed locally and distributed to markets throughout the eastern United States.

Production of shrimp is fairly uniform along the coast of Georgia. The major portion of the catch is within 3 miles of the barrier islands. The harvest of blue crab has increased rapidly during the past 10 years.

Oysters are of little commercial value because of the small number of unpolluted areas suitable for their growth. Of the various finfish taken by commercial fishing operations, only shad, king whiting, flounder, and catfish are of major importance. The catch of king whiting has increased considerably in recent years. At the same time, catches of flounder and catfish have fluctuated widely.

The Coastal Fisheries Division of the Georgia Game and Fish Commission, and the Florida State Board of Conservation enforce the laws and regulations relating to salt-water fishing. There are numerous programs of research, development and service in the Southeast though few are headquartered in the basins. The U. S. Bureau of Commercial Fisheries has an active exploratory fishing program along the southeast coast and is testing new kinds of gear toward more efficient harvest. Technological services are directed toward development of new markets for fishery products. The Bureau of Commercial Fisheries also provides market news service and assists the industry with loans to qualified fishermen.



Figure 2.20 Fishing in Roadside Ditches Suggests Need for Improved Areas.

Needs and Opportunities

Wildlife and Sport Fisheries

In 1960, hunting and fishing afforded approximately 778,000 user-days of outdoor activity out of a total need of 847,000 user-days. The projected demand for hunting and sport fishing is expected to increase to 2,070,000 user-days by the year 2000.

The total population increase and the trend toward urbanization were considered in projecting hunting and fishing demands. Per capita

demand for hunting and fishing decreases as the degree of urbanization increases. A decrease in the rural population is expected within the boundaries of the Satilla-St. Marys basins. However, the needs of Jacksonville, with an expected urban population of 960,000 persons by 2000, must be considered. The net effect of population growth in the basins and its service area will result in a significant increase in the total demand for hunting and fishing in spite of an expected decline in per capita demand after 1975.

Use of publicly owned and managed areas will continue to increase at a rate greater than the general increase in population and overall hunting and fishing effort. This, too, reflects the impact of urbanization.

Analysis of needs for hunting opportunity in relation to supply and development potentials resulted in placing greater emphasis on big game hunting in 1975 and 2000. With normal expansion of going programs large deficits in big game resources are expected, but land use trends favor the accelerated development of white-tailed deer to required levels. With redistribution of the hunting effort, the supply of small game resources is expected to be adequate. The problem of availability, however, will become acute with closure of additional lands to public use.

Waterfowl hunting is not a major sport in the basins and will be difficult to develop. The rice plantations have been largely abandoned and the old fields now grow plants of relatively low waterfowl food value. Waterfowl which fre-

TABLE 2.11
Wildlife Needs and Supply
(thousands)

Year	Type of resource	Needs User-days	Supply		Deficit User-days capacity
			Acres of habitat	User-days capacity*	
1960	Big game	58	2,526	90	0
	Small game	138	3,444	296	0
	Waterfowl	12	464	5	7
1975	Big game	111	2,526	100	11
	Small game	256	3,444	297	0
	Waterfowl	18	464	5	13
2000	Big game	146	2,526	110	36
	Small game	298	3,444	297	1
	Waterfowl	25	464	5	20

* Based on existing and prospective numbers of game animals with normal expansion of going programs.

TABLE 2.12
Sport Fishing Needs and Supply
(thousands)

Year	Type of resource	Needs	Supply		Deficit
		User-days	Acres of habitat	User-days capacity*	User-days capacity
1960	Streams	115	10	150	0
	Large impoundments	13	2	20	0
	Small impoundments	262	8	200	62
	Salt water	249	560	2,800	0
1975	Streams	140	10	150	0
	Large impoundments	421	2	20	401
	Small impoundments	265	13	325	0
	Salt water	385	560	2,800	0
2000	Streams	200	10	150	50
	Large impoundments	452	2	20	432
	Small impoundments	423	20	500	0
	Salt water	526	560	2,800	0

* Based on existing and prospective fish populations with normal expansion of going programs.

quent the offshore waters are, for the most part, inaccessible to the sportsmen.

In 1955, the streams of the basins provided about 18 percent of the total fishing effort in the basins. Large impoundments provided only about 1.5 percent of the total fishing effort. The remainder was sustained by small impoundments and salt water.

In recent years, most of the sport fishing effort in the basins has been provided by the small impoundments which are numerous and well distributed in relation to population centers, and which afford satisfactory fishing. The streams and associated lakes are also heavily utilized since they are available to free public use and afford excellent fishing when water stages are favorable. There is a need, however, for more large impoundments.

A deficiency in the fishing capacity afforded by streams and large impoundments is evident by 1975 and 2000.

Salt-water fishing in the basins is highly esteemed by many fishermen. This form of sport fishing is rapidly growing in popularity with the development of larger boats and motors which afford dependable transportation to waters farther offshore.

No problem of supply with respect to salt-water fishing is foreseen. The coastal waters are capable of producing far more fish than that re-

quired to meet projected requirements. However, there is a need for better access to the fishing waters and for piers and artificial reefs to provide improved sites for fishing.

Commercial Fisheries

The annual demand for food fish landed at ports in the Satilla-St. Marys basins is expected to increase to 10.7 million pounds by 1975 and to 17.4 million pounds by 2000. The catch of industrial fish is also expected to increase to 46 million pounds by 1975 and 74 million pounds in 2000. The average annual catch from 1955-59, amounting to about 8.3 million pounds of food

TABLE 2.13
Commercial Catch Requirements
(thousands of pounds)

Resource	1960*	1975	2000
Food fishes			
Shrimp	2,928	3,076	3,600
Crabs	4,771	5,766	7,100
Oysters		73	500
Selected finfish	327	400	500
Other fishes	245	1,385	5,700
Subtotal	8,271	10,700	17,400
Industrial fishes	34,000	46,000	74,000
Total (all fishes)	42,271	56,700	91,400

* Based on average annual catch of 1955-59.

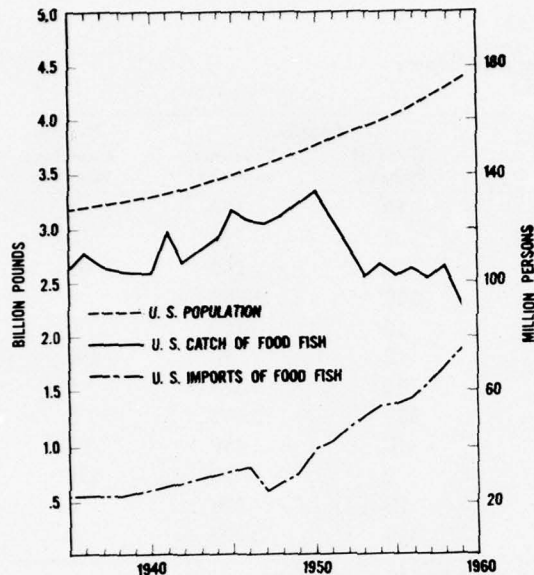


Figure 2.21 National Trends in Food Fish.

fish and 34 million pounds of industrial fish, is considered to be the basins share of the United States market. The projected catch is based on improved technology with corresponding decreased costs and reflects the pounds of fish which must be caught to meet the basins share of the United States share of the market in 1975 and 2000.

In making these projections of production requirements, it was recognized that domestic production in the Southeast River Basins and in the Nation declined during 1950-60. Factors mainly responsible for this decline were fluctuations in supply, increased costs, competition from other animal protein foods and from fishery products from abroad, and lack of knowledge of the sea and its resources. Fish imports increased steadily during the same period.

Production goals by type of fishery were established after consideration was given to feasibility of developing specific resources to meet future needs.

Means of Meeting the Needs

Wildlife and Sport Fisheries

Provision could be made to safeguard the wildlife resources of the coastal islands if they are developed for commercial purposes. While the development of these areas would undoubtedly

increase the use of both wildlife and fish resources, it would be difficult, if not impossible, to preserve the intangible wildlife values of these islands without special provisions.

Big game developments afford one of the most feasible means of meeting future demands for hunting. With more intensive management, the habitat could supply the expected big game demand plus a considerable amount of the demand for small game and waterfowl hunting. The general trend in land use favors big game enhancement. Some loss of habitat is expected through urban and industrial development, but this may be generally offset by conversion of other lands to forests. Forestry practices, which replace the hardwoods with solid pine stands and drain and clear mixed forest land, tend to reduce the carrying capacity of habitat.

Under favorable conditions and with sustained management at the present level, an inventory of 22,000 big game animals is expected by the year 2000. An additional 7,000 head of big game, however, will be needed to meet the minimum standards for this type of hunting. The big game population should be well distributed throughout the area of suitable habitat and at least 50 percent of the range should be open to public hunting.

The key features of this program should consist of a system of management areas developed cooperatively by Federal, State, and private interests. Industrial tree farmers would play an important part in its implementation. A coordinated approach to timber-wildlife management, similar to programs now underway on national forests, would be desirable.

The task of developing small game resources lies primarily with the landowners, particularly farmers. Bobwhite quail and mourning dove, the most popular game species in the basins, are prevalent because of the type and pattern of land use. Employment of agricultural practices which provide food and cover for wildlife could be encouraged. Prescribed burning, roadside planting, and establishment of food and cover strips could be employed more extensively by owners of commercial forests. Emphasis should be given to this type of program on all lands within the existing and proposed management areas and to keeping these areas open to public hunting.

Meeting the need for waterfowl hunting is not

a problem which can be effectively attacked solely by more intensive management. The problem extends beyond the basins borders. The duck population along the Atlantic Flyway, after remaining essentially static for several years, has resumed its decline. However, the waterfowl value of the wetlands of the Satilla-St. Marys basins could be enhanced by a program oriented toward preserving and developing the existing wetlands *to increase the attractiveness of the habitat* and by increasing production of resident species.

A balanced program of stream and lake improvement and development is needed to meet present and future needs.

It is expected that, if the present trend in farm-pond construction continues, there will be more than enough fish produced in small impoundments to sustain the demand for this type of fishing provided that these ponds are well distributed and *available to the public*. An expansion of the current fisheries program, however, will be needed to service these and other impoundments and thereby increase the acreage which affords quality fishing.

There is a marked deficit in the acreage of large impoundments. An increase in the number of large impoundments will be required to produce the weight of fish necessary to satisfy the anticipated fishing pressure.

A deficit in the supply and availability of sport fish in streams is also apparent. Management to meet the demand for stream fishing depends largely upon improvement of existing habitat and development of public access and facilities on the streams.

Flow regulation could increase the potentials for fish in the streams and extend the period when conditions are favorable for sport fishing. Flow regulation would also permit needed stream fluctuation for best fish production and harvest. Regulated streamflow, along with sewage treatment and proper disposal of industrial wastes, would also reduce pollution problems and enhance the stream values.

To preserve and increase the public fishing opportunity, existing programs of access development should be greatly expanded. Minimum facilities at each site should include a concrete boat-launching ramp and parking area. Camping facilities would increase their utility.

The capacity of the salt-water fishery resources *to satisfy the projected demand* is limited more by the number and type of facilities for fishing than by the extent and productivity of habitat. The inshore waters of the basins are apparently capable of maintaining their present high productivity. However, there is need for improved services, accommodations and more facilities, if the resources are to be more fully utilized.

To enhance the value of the sport fishery, there is a need for additional motels and boatels, and new fishing camps with complements of *boats and guides*. Public access sites to salt water should be developed and equipped with launching ramps or power hoists, fishing piers, parking areas, and associated facilities.

Commercial Fisheries

The once valuable oyster fishery in the basins has declined to a record low. Many productive oyster reefs are closed to commercial harvest because of pollution; many others have been overexploited. This fishery could be restored *by abatement of pollution and the development of more efficient practices and governing regulations*.

Known shrimp resources are utilized at the present time. Studies should be undertaken concerning the biology of the shrimp and the effects of fishing on the populations. New sources of supply need to be discovered.

The catch of finfishes could be expanded with improvement in method of processing and distribution. Studies should be undertaken to *improve existing methods of handling and processing mullet, speckled trout, and other finfish* and to create products of more competitive quality with seafoods from other areas. Improved gear and methods of fishing should be developed and the fishing effort intensified. The program of exploratory fishing should be accelerated with a view toward finding additional potentials for augmenting the commercial harvest of finfishes.

Fish culture possibilities should be investigated. The oyster industry might be revived by *application of cultural methods such as the Japanese system of collecting and growing oysters on racks*. Means for protection from predators should be applied. *The feasibility of shrimp farming* could be demonstrated by actual production in coastal impoundments. Hardshell clams

may be a future source of commercial farming operations. Present experiments on their culture should be encouraged. Studies could also be made toward the management and possible commercial cultivation of the stone crab and the soft-shelled crab.

Industrial fish, mostly menhaden used for oils, fertilizer, and fish meal are an important part of

the coastal economy. Fishing effort is greatly influenced, however, by lowering prices due to foreign imports. Studies of the fishery biology, new uses of the fishes in commerce, and marketing practices, are needed to boost this fishery. Technological improvements will further increase catches with less effort.

SECTION IX – RECREATION

General

The Satilla-St. Marys basins significant outdoor public recreation resources include the major offshore islands, such as Cumberland Island and streams which have a natural beauty and offer extensive opportunities for recreation development. The basins contain transportation routes that carry heavy tourist traffic between the northeastern United States and Florida. It is only a short drive from the urban centers of Savannah, Augusta, Macon, and Jacksonville to points within the basins. The basins now provide excellent vacation spots and additional recreation opportunities could be provided for the traveler and the resident.

Existing Facilities and Programs

The ocean shoreline now satisfies a sizable share of the present recreational demands. The following recreation areas accommodated a major segment of accountable outdoor recreation in 1960:

(1) Laura S. Walker State Park—Boating, camping, and picnicking are secondary to fishing at this 160-acre park just north of the Okefenokee Swamp.

(2) Waycross State Forest—This forest, which contains Laura S. Walker State Park, is administered by the Georgia Forestry Commission.

(3) Fort Frederica National Monument—St. Simons Island, Georgia. This 94-acre site is the location of Oglethorpe's fortified English town. There are indoor and outdoor interpretive exhibits.

(4) Sea and St. Simons Islands, Georgia—Five miles long, rather narrow beaches are located on the ocean side of Sea and St. Simons Islands. Private development has blocked public access to

the beach in many areas, but there are still portions of the beach which could be developed for public use.

(5) Jekyll Island State Park—Administration of this 11,000-acre island is vested in the Jekyll Island State Park Authority. Portions of it are being subdivided for long-term lease for homesites. On the island are modern motels, good beaches, swimming, boating, picnicking, golfing, and museum facilities. Once the cloistered home of millionaires, its entire area is now dedicated to the use of the public.

(6) Crooked River State Park—This 582-acre park is located near Kingsland, Georgia. It provides facilities for swimming, camping, and picnicking.

(7) Fort Clinch State Park—Amelia Island, Florida—Its 1,085 seashore acres have historical and scenic attractions such as Fort Clinch, and



Figure 2.22 Jekyll Island, Georgia Has Areas for Picnicking and Many Other Facilities for the Vacationist.

RECREATION

1960

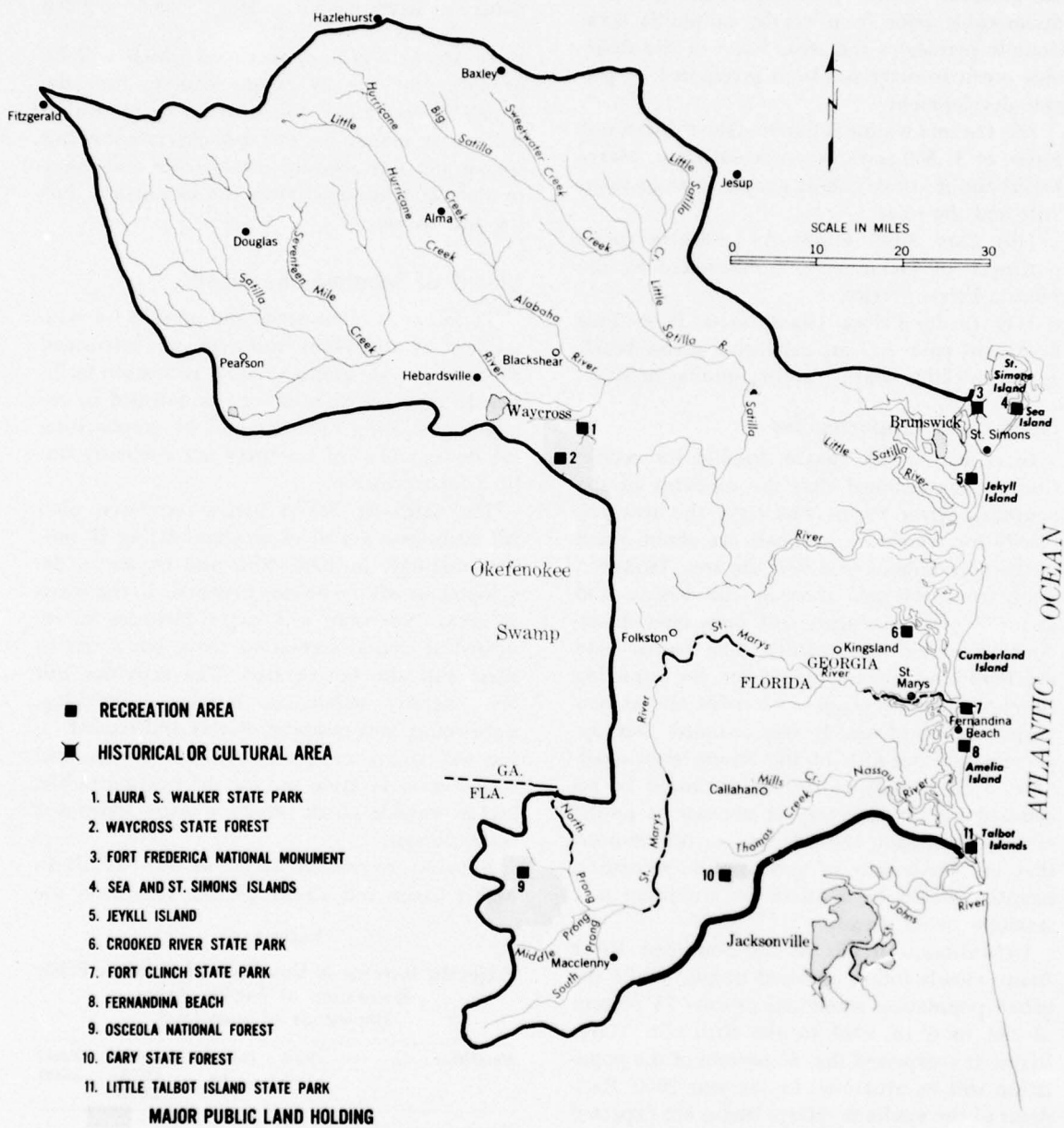


Figure 2.23

Fort Clinch museum. The park contains facilities for picnicking, camping, sightseeing, and swimming.

(8) Fernandina Beach, Florida—Many consider this beach to be equal to some of the more popular vacation centers of Florida. However, the glamour of luxury hotels is lacking and a disagreeable odor from nearby pulpmills occasionally permeates the area. Some of the desirable ocean frontage has been preempted by private development.

(9) Osceola National Forest—One-third of this forest, or 47,600 acres, is in the Satilla-St. Marys basins and it attracts many people from Jacksonville and the coast.

(10) Cary State Forest—A 3,400-acre forest northwest of Jacksonville, administered by the Florida Forest Service.

(11) Little Talbot Island State Park—This 2,500-acre park has an expansive ocean beach with picnicking, boating, and swimming facilities.

Needs and Opportunities

In estimating the future demand for recreation, it was assumed that the residents of the Southeast River Basins who leave the area primarily for recreation purposes are about equal to the nonresidents who visit the area. However, many travelers pass through the basins, and about 60 percent of these seek some type of outdoor recreation opportunity. The basins have excellent land and water resources for attracting recreation-seeking people as tourists and as new permanent residents. It was assumed that approximately one-fifth of the leisure days available to the people of the basins would be accounted for in some way or another at public outdoor recreation areas. It was further assumed that the availability of good public recreation facilities would be a factor in attracting new residents to the area.

Urbanization trends in the Southeast River Basins closely follow national trends. While the urban population amounted to only 28 percent of the total in 1930 in the Satilla-St. Marys basins, it is expected that 80 percent of the population will be urbanized by the year 2000. Residents of the Satilla-St. Marys basins are expected to need about 7.3 million user-days of outdoor recreation by 2000. There will be opportunity for 20 million user-days in the basins. Thus,

TABLE 2.14
Recreation User-Days—1960, 1975, and 2000
(millions)

	1960	Projected need	
		1975	2000
Satilla-St. Marys Basins ..	2.5	9.5	20.0
Southeast River Basins ...	35.0	95.0	230.0

there are 12.7 million user-days which will be available for use by people coming into the basins for recreation. The demand for recreation will occur mainly in the summer months, but spring and fall also are comfortable and many outdoor recreation activities can be pursued during this season.

Means of Meeting the Needs

To satisfy resident needs and provide for non-resident requirements calls for an intensified effort to increase public outdoor recreation facilities. In many cases, needs can be satisfied by expanding existing facilities and by emphasizing the development of resources not currently utilized for recreation.

The Satilla-St. Marys basins recreation plan is based upon a goal of accommodating 20 million user-days in 2000. New and expanded developments will be needed primarily in the coastal areas. Not only will larger facilities be required at coastal recreation areas, but access to them will also be required. The activities will be generally swimming, boating, picnicking, sightseeing, and camping. Rivers and coastal inlets will afford an opportunity for day use and longer term vacation use for the boating public and as wayside picnic areas for many additional recreationists.

Existing recreation areas in the Satilla-St. Marys basins can absorb greater recreation use

TABLE 2.15
Projected Increase in User-Days of Outdoor Public Recreation at Facility Areas
(thousands of user-days)

Facilities	1960	Increase		Total 2000
		to 1975	1975- 2000	
Expanding facilities at existing areas ..	2,505	2,995	4,700	10,200
New areas	—	3,960	5,840	9,800
Total	2,505	6,955	10,540	20,000

mainly by expansion of facilities on the coastal islands. Existing areas on Amelia, Little Talbot, Jekyll, and St. Simons Islands could accommodate 2,350,000 user-days in 1960. These areas will require more land, parking areas, improved access, picnic tables, walks, shelters, bath-houses, sanitary facilities, water supply, and administrative centers. Such development not only satisfies the user but also enhances commercial development, motels, restaurants, concessions, and private summer homes.

The existing inland areas with accommodations for 155,000 user-days in 1960 should be developed to absorb an increase in use. Waycross and Cary State Forests could be developed for swimming, picnicking, and camping as part of a broad recreation plan. Osceola National Forest, Crooked River, and Laura S. Walker State Parks could also supply additional recreation opportunity with development of more facilities.

New opportunity would involve the acquisition, construction, development, and provision of access to areas which at present share no part in present recorded public outdoor recreation. Public access sites along the major rivers and sheltered tidal waterways, development of the south end of the Amelia Island, upstream watershed programs, and use of multiple-purpose impoundments are ways of increasing recreation and to accommodate the increased demands expected.

The construction of large and small water impoundments properly spaced would provide opportunities for outdoor recreation. Storage for low streamflow augmentation would improve the quality of the water in the rivers and make them more desirable for recreation use.

Cumberland Island is one of the last remaining areas suitable for acquisition and is of lasting national significance. It could be set aside



Figure 2.24 Fort Clinch, Used in the Civil and Spanish-American Wars, Is One of Several Historical and Recreational Attractions in Fort Clinch State Park, Amelia Island, Florida.

before its superb resources are impaired for public recreation.

Historic and cultural areas could also provide opportunity for recreation. Three sites have been identified as having unusual significance. The town of St. Marys, Georgia, offers the opportunity to interpret the early history of this section of the country. Bartram's Ixia, a rare plant growing in Baker County, Florida, and the ruins

of Tabby Sugar House, are further described in Part Four. They are areas which could help round out the diversity of recreation opportunity within the basins. It would seem appropriate for the respective State and local agencies to develop these areas. It would be desirable to include these sites as part of a larger recreation area, where sufficient land and water would attract recreationists seeking a wider range of recreation activities.

SECTION X – SALINITY AND SEDIMENT CONTROL

General

Salinity and sedimentation problems in the Satilla-St. Marys basins are localized.

Salinity problems occur when enough salt accumulates in the soil to impair crop productivity or when salt water intrudes into fresh-water areas so as to interfere with water use, needs, or availability.

Sediment problems result when water transports and deposits silt, sand, and other matter in reservoirs, ditches, channels, and other areas where they are not wanted or when these materials in the water curtail its use.

Sediment yield in the basins is very low because most of the basins drainage area is of low relief and sandy surface soils. The sediment yields from erosion vary throughout the basins. Sample tests indicated sediment yields of 1.72 tons per square mile on South Prong, St. Marys River watershed, and 15.24 tons per square mile on Little Satilla Creek watershed. The average concentration of suspended sediment of streams in the Satilla River is estimated at 20 parts per million. Annual suspended loads are probably in the range of 19,000 to 56,000 tons. Data suggest that the bedload may constitute 10 percent of the total sediment load. Concentrations of such low magnitude do not present serious problems.

Saline soil problems occur on a total of 219,300 acres in four counties as follows: Glynn, 69,600 acres; Camden, 87,700 acres; Nassau, 22,100 acres; and Duval, 39,900 acres.

The total area of saline soils in the Satilla-St. Marys basins amounts to about 6 percent of the total basins area. No concerted effort has been made to reclaim or rehabilitate areas lost

to saline conditions because of the high costs associated with reclamation. Saline soils in the salt-water marshes are used largely for grazing cattle and as habitat for wildlife. Salt-water intrusion of ground water supplies may become a problem in Glynn County, Georgia. Continued extensive water supply development near the ocean with high withdrawal of water from the principal aquifer could result in salt-water intrusion along the coast.

Existing Facilities and Programs

Salinity Control

There are no existing programs specifically for the control of soil salinity. There are programs for surveillance of ground water salinity intrusion in certain coastal areas.

Sediment Control

There are no existing programs specifically for sediment control. Programs for land treatment and flood prevention and drainage have considerable effect in preventing and controlling sediment problems.

Over the past 20 years, establishment of conservation practices and the increase in tree-seedling plantings have greatly reduced erosion and sediment loads. Individual landowners and operators have applied measures for conserving, utilizing, and improving various types of land uses in the basins. Over 1,900 farm ponds have been built which, collectively, have large sediment-trapping capacity. Furthermore, it is estimated that \$4,400 of the annual cost for operation and maintenance of drainage ditches used

SEDIMENT

1960

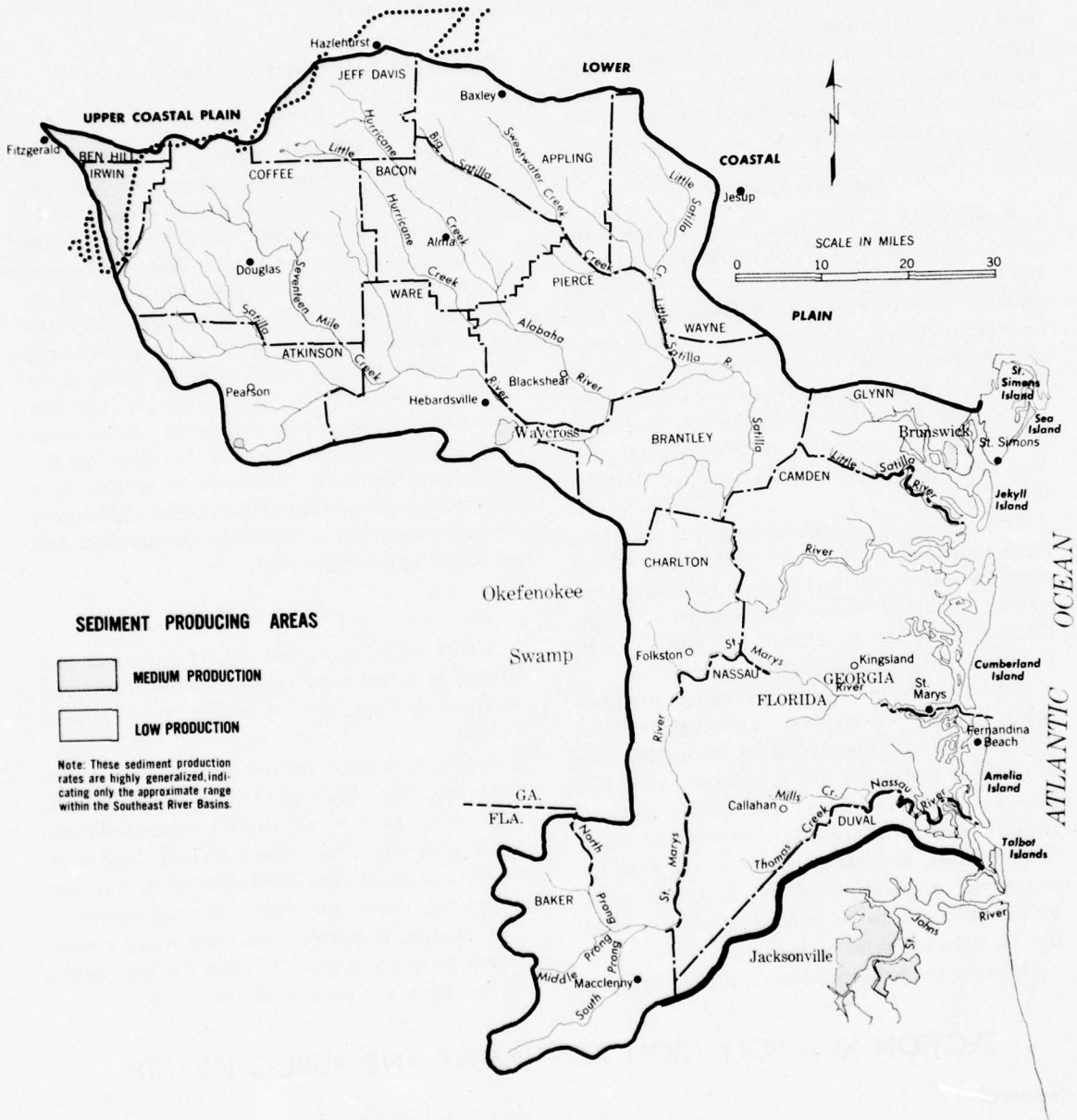


Figure 2.25

to drain about 110,000 acres of land is attributable to removal of sediment.

Needs and Opportunities

Salinity Control

The need for agricultural land will not necessitate reclaiming or rehabilitating any major portion of the saline soils in the basins for agricultural use until well after the year 2000. There are opportunities near the Atlantic coast for prevention of the encroachment of salt water into the ground water supplies.

Sediment Control

Erosion damage on critical sediment-producing areas is a problem on about 16,500 acres of land. Of this acreage, project action may be needed on 6,800 acres involving 1,691 farms. These acreages occur mostly in upland areas where intensive cultivation has resulted in accelerated erosion. Erosion control practices can correct a large part of the sediment problems in this portion of the basins. The reduction of sediment will prolong the useful life of water resource developments.

The acreage estimated to require land-treatment measures by the years 1975 and 2000 are given in Section VI, Soil Conservation and Utilization. Although these measures are not specifically for sediment control, one effect will be to reduce sediment production.

Roadside erosion problems occur predominantly along unsurfaced county-maintained roads. Stabilization is needed for about 250 miles of roadside where soil loss is estimated at 25,000 tons per year. Treatment and stabilization of roadside areas would result in reduction of maintenance costs, at least as much as the cost for treatment. Application of recommended measures is estimated to be at least 90 percent effective in reducing rates of soil loss.

Measures for sediment control along highways

can be installed most effectively as parts of overall watershed treatment and highway programs. This approach utilizes local government entities and other sources of financial and technical assistance programs. With the expected new highway construction, roadside erosion control needs probably will increase 15 percent by 1975 and 25 percent by 2000.

Means of Meeting the Needs

Salinity Control

Salinity in the soil is not a problem in the basins which must be solved at present. Near the Atlantic coast, the withdrawal of ground water supplies can be controlled so that the backflow of ocean water into the aquifer does not become a problem. Such control must be based on an accurate geologic estimate of the safe yield balanced against the proposed use. To prevent the occurrence of major losses from the rising ocean level, a reasonable zoning program for land uses in coastal areas could be considered. Under existing legislation, zoning would be done by the cities and counties. However, since this is a matter of regional importance, regional planning would greatly aid in clarifying the problem and stimulating needed action.

Sediment Control

Under existing, authorized, or proposed programs, most sediment control will be incidental to the major purposes for which the works were devised.

Sediment control, insofar as it affects agricultural and other land in the basins, can best be effected as part of an overall watershed-treatment program. This would include land-treatment measures on the 6,800 acres of land requiring project action for erosion-damage reduction. The existing nonproject soil and water conservation program appears to offer the best means for reducing the erosion in the basins.

SECTION XI - POLLUTION ABATEMENT AND PUBLIC HEALTH

General

Public health is important in resource development. Economic growth is retarded when

poor health causes a loss in production or necessitates high expenditures for personal medical attention. Programs in this field are concerned

1960



2-43

with improving health, welfare, and safety of the entire population.

Only those phases of public health directly related to land and water resources development are included in this study. Items discussed in this Section include: The abatement of water and air pollution; radiation monitoring; collection, treatment, or disposal of community and industrial wastes; and vector control. The development and protection of potable water supplies, as discussed in Section II, are also an important part of public health programs. The basic objective of public health is the protection of community health through the control of man's environment.

Air pollution results from many of man's activities. The extent of air pollution and its effects on the population will depend upon population distribution; industrial, commercial, and agricultural activity; fuel usage; and waste-disposal practices. Meteorology, topography, and other natural features influence dispersion of pollutants and, thus, are important factors in determining pollution levels which may occur. Concentration of certain toxic airborne materials may be fatal to man or may impair the growth of vegetation. Such impairment could produce blighted areas and restrict land use. While there are few major air pollution problems originating within the basins, the area should be included in an overall air pollution program which is essential for the protection of the surrounding atmosphere of the Southeast River Basins area.

Pollution can destroy the usefulness of the water and limit its reuse. The liquid and water-carried waste of municipal, industrial, and agricultural activities eventually finds its way to the water courses. The objective of the water pollution control program is to prevent waste loading that exceeds the assimilating capacity of the receiving streams so that water of suitable quality may be available for reuse.

Solid municipal and industrial waste requires land for disposal. The proper disposal of such material can provide for land reclamation and prevent the leaching of materials which could affect the quality of the water.

Background levels of radiation should be determined for the basins. Continued radiological monitoring would then indicate any increase from manmade radiation which, because of its

long-life characteristics and lethal properties, could directly affect land and water resources use and development.

Vector control can have a beneficial effect on the development of the land and water resources. The mosquitoes of the area are not only a nuisance but also may carry disease. Land and water management practices are an essential part of a vector control program.

Existing Facilities and Programs

Pollution Abatement

In general, the basins are relatively free from serious pollution problems. Limited reaches of some of the streams and tidal areas were receiving excessive amounts of wastes in 1960. Five new municipal sewage treatment plants were placed in operation during 1960 and a sixth plant was being doubled in size. The efficient operation of these waste treatment plants will improve the quality of the receiving waters.

The main rivers of the Satilla-St. Marys basins and most of their tributaries flow through wide, swampy flood plains. These swamps help keep the turbidity in the streams low. They also contribute a typical dark stain and change the physical and chemical quality of the water. During normal conditions, the swamps provide an effective barrier against contamination by man-made pollution carried by surface runoff. Heavy surface runoff following extended drought periods may flush stagnant water from the swamp areas and create some water quality problems. This could create hazardous conditions where the swamps are relied upon to assimilate untreated discharged wastes.

Ten municipalities with populations of 800 or more did not have sewage collection systems in 1960. Of the 12 existing municipal sewerage systems, 10 did not serve their entire populations. Some industrial wastes are discharged into the municipal sewerage systems. In addition to the municipal systems, there are sewerage systems for Jekyll Island, Georgia; Fort Clinch, Amelia Island, Florida; Air Traffic Control Center, Hilliard, Florida; Glynnco Naval Air Station, Georgia; and Northeast Florida State Hospital, Macclenny, Florida.

Twenty-nine industrial plants maintained separate waste systems in 1960. Little or no treat-

TABLE 2.16
Sources of Municipal Pollution

Municipality	Population		Treatment			Receiving stream
	1960	Served	Type ¹	Design capacity PE (1,000)	Waste load PE ² (1,000)	Load to stream
Florida						
Callahan.....	782	560	(1)	1.500	0.300	Alligator Creek;
			(0)	0.250	0.250	Nassau River; PE 159
Fernandina Beach.....	7,276	4,500	(1)	7.500	4.500	Amelia River; PE 2,920
Macclenny.....	2,671	1,750	(2)	4.140	1.750	Turkey Creek, St. Marys River; PE 440
Georgia						
Alma.....	3,515	2,280	None	--	4.900	Big Hurricane Creek; PE 4,900
Baxley.....	4,268	3,150	(2)	5.000	3.300	Sweetwater Creek; PE 350
Blackshear.....	2,482	2,480	(2)	3.000	2.480	Alabama River; PE 248
Brunswick.....	21,703	21,700	None	--	21.700	Brunswick River; PE 21,700
Douglas.....	8,736	7,500	(2)	40.000	13.000	17 Mile Creek, Satilla River; PE 1,300
Patterson.....	719	120	None	--	0.120	Swamp 10 miles to Little Satilla River; PE 120
Pearson.....	1,615	800	(1)	0.750	0.800	Swamp 6 miles to Little Red Bluff Creek; PE 600
St. Simons.....	3,199	1,900	(1)	5.000	2.200	Dunbar Creek; PE 1,400
Waycross.....	20,944	18,000	(2)	35.000	22.000	Satilla River; PE 2,200
Airport subdivision.....	--	1,500	(1)	3.500	1.500	Kettle Creek; PE 970
Federal and State installations						
Florida						
Fort Clinch.....	--	800	(0)	0.130	0.800	No discharge
State Hospital.....	--	675	(2)	1.600	0.675	South Branch Turkey Creek, St. Marys River; PE 35
Air Traffic Control Center.....	--	370	(2)	--	0.370	Ditch, Little St. Marys River; PE 40
Georgia						
Glynco NAS ³	1,700	2,000	(2)	2.850	2.000	Mackay River; PE 200
Jekyll Island.....	200	2,000	None	--	2.000	Jekyll River; PE 2,000

NOTES: ¹ (0) Septic tank serving a part of the population; (1) primary treatment; (2) secondary treatment.

² Includes some industrial wastes; volumes and strength of combined wastes are estimated. PE = population equivalent is based on pollution effect of waste. The PE shown is the estimated theoretical loading on the streams, based on the degree of treatment.

³ Naval Air Station.

ment of the wastes was provided by the industries. In-plant recovery of process chemicals effectively reduces the waste loading from paper industrial plants, but the wastes discharged following the recovery processes still adversely affect the quality of the receiving waters.

Observations made in 1960 of the streams below municipal and industrial waste discharge points indicated the need for proper treatment of the wastes.

Vector Control

The coastal area of the Satilla-St. Marys basins has extensive tidal marshlands affording breeding areas for biting insects. Salt-marsh mosquitoes, sand flies, horseflies, and deer flies occur in large numbers and cause great annoyance to

residents and visitors. Following an unusually high tide or heavy rain, the salt-marsh mosquitoes occur in such large numbers that outdoor activity during the day or night is almost intolerable. It is estimated that each coastal county includes about 10,000 acres of salt marsh and 5,000 acres of fresh-water swamp and marsh-mosquito-breeding land.

In the lower half of the basins, patches of alligator weed and water hyacinth are found in small ditches and drainage creeks. Both of these noxious weeds are spreading. Profuse growth of these weeds tends to clog drainage ditches, canals, and ponds, thereby creating conditions favorable for malaria and other mosquitoes.

In urban areas, vector problems are frequently associated with improper disposal of sewage. In

BASED ON 1960 POPULATION

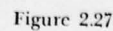


TABLE 2.17
Industrial Pollution Discharged to Streams—1960¹

Industry Type, number, and employees	Volume of waste (m.g.d.) ²	PE ³ or type of waste	Type of treatment	Receiving stream
Chemical	0.075	9,200	None	Amelia River
7	0.004	(inorganic)	None	Sweetwater Creek
1,326	11.984	(inorganic)	None	Purvis Creek
	0.040	(cooling water)	None	Back River
	23.800	20,260	None	Terry Creek
	0.100	(inorganic)	None	Swamp
	0.012	(inorganic)	None	Kettle Creek
Creosoting	0.010	(inorganic)	None	Red Canal
3	0.040	(inorganic)	None	Swamp
104	0.001	(inorganic)	None	Canal
Food	0.060	(seafood processing)	None	East River
11	0.100	(seafood processing)	None	East River
932	0.013	(seafood processing)	None	East River
	0.080	(seafood processing)	None	East River
	0.015	(seafood processing)	None	East River
	3.200	(seafood processing)	None	East River
	0.067	55	None	Gilson Creek
	0.390	326	None	Satilla River
	0.004	150	None	Swamp
	0.080	360	None	Kettle Creek
	0.040	3,700	None	Kettle Creek
Paper	16.000	400,000	Recovery in plant	Amelia River
4	30.000	2,000,000	Recovery in plant	Amelia River
2,500	35.000	196,800	Recovery in plant	Academy Creek
	32.000	86,700	Recovery in plant	North River
Miscellaneous	undetermined	(inorganic)	K ⁴	Canal
4	0.051	(inorganic)	None	17 Mile Creek
1,381	0.018	(inorganic)	Holding basin	Swamp
	0.296	(inorganic)	Holding basin	Satilla River

NOTES: ¹ Industries discharging to land surface or water course.
² Million gallons per day.
³ Population equivalent.
⁴ Chemical coagulation and settling.

about 25 percent of the towns surveyed, over-flowing septic tanks are creating ideal places for the breeding of mosquitoes.

In rural areas, inadequacy of general drainage and the lack of drainage ditch maintenance is responsible for mosquito breeding. Although mosquito breeding in farm ponds can also be a problem, the present construction and operating procedures of the farm ponds in the Satilla-St. Marys basins are controlling the mosquitoes. Properly maintained, sewage stabilization ponds do not create mosquito-breeding problems. Coastal artesian wells originating in limestone aquifers produce an alkaline water that is favorable for the production of malaria mosquitoes. There are 28 unused flowing wells in Camden County, 16 in Glynn, and 4 each in Charlton and Wayne

Counties which can create breeding areas. The lack of sanitation around poultry farms and dairy barns can result in serious fly and mosquito problems.

Present vector control programs consist of one mosquito control district, one countywide mosquito control program, and several municipal mosquito control programs. The Amelia Island Mosquito Control District is a new district in the eastern edge of Nassau County, Florida. Ditches will be constructed to control 3,000 acres of salt-marsh and fresh-water mosquito-breeding areas.

Fogging machines are employed on St. Simons and Sea Islands. Several towns in the basins have small programs for the control of mosquitoes and other vectors.

Air Pollution Monitoring

The Satilla-St. Marys basins, with the exception of the coastal area and an area in Appling County, are free from major sources of industrial air pollution. Four large pulpmills located along the coast produce air contaminants which are carried long distances. Five other sources of industrial air pollution are mills in Baxley, a chemical plant in Brunswick, and a fish-oil industry in Fernandina Beach, Florida. There are other air polluting industries scattered throughout the basins, but no complaints have been received from other sources.

Solid Waste Disposal

There are two modified sanitary landfills in operation in the basins, one at Waycross and the other at Brunswick, Georgia. The Jekyll Island State Park Authority has an incinerator to dispose of solid wastes. The other urban areas have been using open dumps.

Radiation Monitoring

Two industries and one hospital in the basins have been licensed by the Atomic Energy Commission to use radioactive isotopes. One plant nursery in Nassau County, Florida, used radioactive isotopes in 1958. Data are not available as to the present status of this use. Corresponding with the temporary cessation of worldwide nuclear testing, a marked decrease in radioactivity of surface waters and rainfall became apparent late in the spring of 1959 and continued for the remainder of the year. After testing was resumed in 1960, the fallout again increased the radioactivity of the area. The radioactivity level in the basins, according to available data, is well

below points where concern need be expressed over its effect on land and water resources development.

Needs and Opportunities

Pollution Abatement

A policy of pollution prevention, as well as abatement, is needed. Organic wastes not amenable to conventional treatment and all inorganic wastes need to be reduced to satisfactory limits before discharge into the streams. Treatment could be provided for all industrial and municipal wastes prior to the discharge to the water courses. The type of treatment required will depend upon the waste to be treated and the assimilating capacity of the receiving stream. Separate determination will be needed in each case.

Primary treatment of municipal sewage and equivalent treatment of industrial waste affecting the substantial removal of settleable solids is the minimum acceptable treatment necessary to assure satisfactory water quality in the receiving streams. Where critical streamflows are too small to provide proper dilution of effluent from primary treatment plants, secondary treatment should be added. If the effluent from the secondary treatment plant exceeds the assimilating capacity of the streams, additional dilution water or a higher degree of treatment will be needed to adjust the waste load to the minimum streamflow conditions.

In estimating sewerage needs, all towns with populations over 800 have been included. Also included are the smaller towns which had sewerage systems in 1960.

Industrial waste-treatment facilities are

TABLE 2.18
Municipal Sewerage Needs

State	Period	Population served	Number of places requiring:		
			Primary treatment	Secondary treatment	Sewers—New or extensions
Florida	1960-1975	22,000	1	4	6
Georgia	1960-1975	126,000	1	12	17
Total	1960-1975	148,000	2	16	23
Florida	1975-2000	34,000	0	1	5
Georgia	1975-2000	239,000	1	7	20
Total	1975-2000	273,000	1	8	25



Figure 2.28 Modern Sewage Disposal Plant at Waycross, Georgia. Adequate Disposal Facilities Are Essential for Health and Continued Use and Development of Resources.

needed at all the existing industries and should be required of all new industries for the proper handling of their wastes. Degree of treatment should be based on downstream water uses, and water quality suitable for reuse should be maintained in the streams.

Vector Control

There is no statewide enabling legislation for the establishment of vector control districts in Georgia. Adequate legislation of this nature does exist in Florida. Both Georgia and Florida have specific health regulations pertaining to the impounding of water and the construction of farm ponds. There is a need for more emphasis on both mosquito larviciding and permanent control measures. A statewide enabling act in Georgia would permit better coordination of the programs in this State.

There are very few vector control programs in the rural areas of the basins except that most of the county health departments provide technical advice and assistance for vector control.

A mosquito control district in Glynn County has been considered by local officials for a number of years and is badly needed. Some work is now being done countywide on mosquito control. This program needs to be expanded to include permanent control measures. The proper use of impoundments will reduce both sand-fly breeding and mosquito production.

Air Pollution Monitoring

A statewide, air pollution study by the Georgia Department of Public Health and U. S. Public Health Service was inaugurated on January 1, 1961. This survey should more clearly define legislative and program needs. Florida

recently completed a similar study. Data is needed to effect measures for control of pulp and paper industries odors.

Solid Waste Disposal

Sanitary landfills are needed for the disposal of solid wastes in the Satilla-St. Marys basins.

The amounts of solid wastes produced nationally averages about 1 cubic yard or 650 pounds per person per year. To dispose of waste by sanitary landfill requires 1 acre per 10,000 persons per year. The average cost of collecting solid waste and disposing of it in sanitary landfills varies inversely with the size of the town, as the larger cities have less per capita cost. The cost, including land cost, ranges from \$4.50 to \$1.50 per capita per year.

Radiation Monitoring

There is a need for radiological health surveillance as part of the expanded health department program in the Satilla-St. Marys basins. Such a program would require funds and personnel to monitor milk and other food programs and programs to assure adequate control of health hazards involved in the use and disposal of radioactive isotopes.

Means of Meeting the Needs

Pollution Abatement

New sewerage systems, including treatment facilities, will be required to serve a 1975 population of about 148,000 persons. It is estimated that, prior to the year 2000, two other urban centers will require complete new sewerage systems. All existing municipal sewerage systems should be extended to provide service for the entire urban population. Adequate treatment should be provided of all wastes before they are discharged.

Industrial waste-treatment facilities should be constructed for each industry. Detailed studies should be made of the industrial waste to determine the pollution abatement needs and the degree of treatment required. Industries located in the tidewater area should provide treatment equal to that afforded by conventional primary treatment plants, except near recreational areas where additional treatment is needed.

In determining the municipal and industrial waste-treatment needs, the entire development of the area should be taken into consideration. As development occurs, field studies will be necessary to determine the degree and type of treatment required to prevent pollution of the receiving streams. Low-flow augmentation will be required in some instances to maintain suitable water quality in the streams. Low-flow augmentation, however, should be considered only after secondary treatment of all wastes has been provided.

Of 29 industries with separate waste outlets inventoried in 1960, none provided treatment of their wastes although two included holding ponds for regulation of discharge. Prior to 1975, waste-treatment facilities designed specifically for the waste to be handled should be constructed. The degree of treatment should be adequate to maintain the quality of the water suitable for reuse in the receiving streams. Waste-treatment facilities should also be installed for all new plants that are established. Prior to the year 2000, all industrial waste-treatment facilities may need to be enlarged.

Provisions could be made for the combined treatment of some industrial wastes with municipal sewage. This could prove mutually beneficial both to the industry and to the municipality, particularly where industries operate on a seasonal basis.

The construction program providing facilities for adequate treatment of the wastes should be scheduled in accordance with a comprehensive water pollution control program. The responsibility for the development of such programs will rest with the States of Georgia and Florida and local communities and should be based on factual data obtained by monitoring the waste discharges and the receiving stream. The program should develop long-range plans for the protection of the water resources, provide technical assistance to the polluters, and regulate all waste discharges.

The polluter should assume his responsibility for providing waste treatment. The degree of treatment to be provided should be based on the volume, the pollutional effect of the waste, the physical situation, and the intended downstream water uses of the receiving stream. From the standpoint of water quality, the best use of water

resources will occur when the waste assimilating capacity of the stream is used to the maximum extent consistent with other water uses. However, a safety factor should be included to provide for unexpected situations.

A stepped-up comprehensive water pollution control program will be necessary to assure adequate protection of the water resources for the future. Educating the general public about the water pollution control needs and the inherent benefits will help municipalities and industries to recognize their responsibility and to finance necessary sewers and treatment works. Existing legislation needs to be implemented to insure the collection of good basic data. Funds should be budgeted for adequate staff and equipment to assure the development of a sound water resources program for the States.

Vector Control

In the interest of efficiency and economy, vector control programs should be carried out on a district or county basis. The State government could carry out research work and provide training and technical supervision to the districts. The Federal Government could assist the States by supplementing their programs. Expansion of existing control programs would be helpful as would legislation to permit formation of legal districts to implement and finance programs.

The importance of vector control to the economy and welfare of the basins should be stressed in comprehensive planning programs for the area.

Air Pollution Monitoring

The States of Georgia and Florida are obtaining factual data needed for the establishment of statewide air pollution monitoring programs. An effective program will require full industrial, municipal, and State cooperation. The responsible State agencies should work closely with industry to develop effective control programs.

Solid Waste Disposal

The sanitary landfill method should be adopted throughout the area for solid-waste disposal. This method effectively reduces the breeding of vectors and insanitary conditions and affords an opportunity to reclaim low marshland or swamp-land for beneficial use. The efficient collection and proper disposal of garbage and trash will improve municipal appearances. Wherever required, sanitary regulations should be revised or new ones adopted to enable all communities to participate in effective sanitary landfill programs.

Radiation Monitoring

Background levels of radiation should be established and monitoring continued to indicate any increased radiation which could directly affect land and water resources use and development. The control and use of radioactive isotopes should be a State responsibility. All State and Federal agencies should maintain monitoring programs to measure the total radiation concentration.

SECTION XII – OTHER BENEFICIAL PURPOSES BEACH EROSION CONTROL AND HURRICANE PROTECTION

General

Preserving and restoring the shoreline and preventing loss of lives and damages to property caused by high tides, waves, and winds from hurricanes are of great importance in this area.

The eight important islands which lie partly or wholly within the boundaries of the Satilla-St. Marys basins on the Atlantic coast are Little St. Simons, Sea Island, St. Simons, Jekyll, Cumberland, Amelia, Little Talbot, and Talbot. All the islands have desirable potential developments but are exposed to the direct action of the sea.

The river deltas are generally areas of swamp and salt-water marshland that are flooded and drained by a labyrinth of sloughs, meandering channels, and estuaries. The water passages through the marshland separate the coastal areas from the mainland and form a network of sea islands. The tidal shoreline is several hundred miles long, but the island coastlines that are exposed to the direct action of the sea have a total length of over 50 miles.

The islands are low and generally have firm land elevations near the shores of 10 to 14 feet above mean low water and slightly higher eleva-

HURRICANE PATHS BEACH EROSION AND ACCRETION

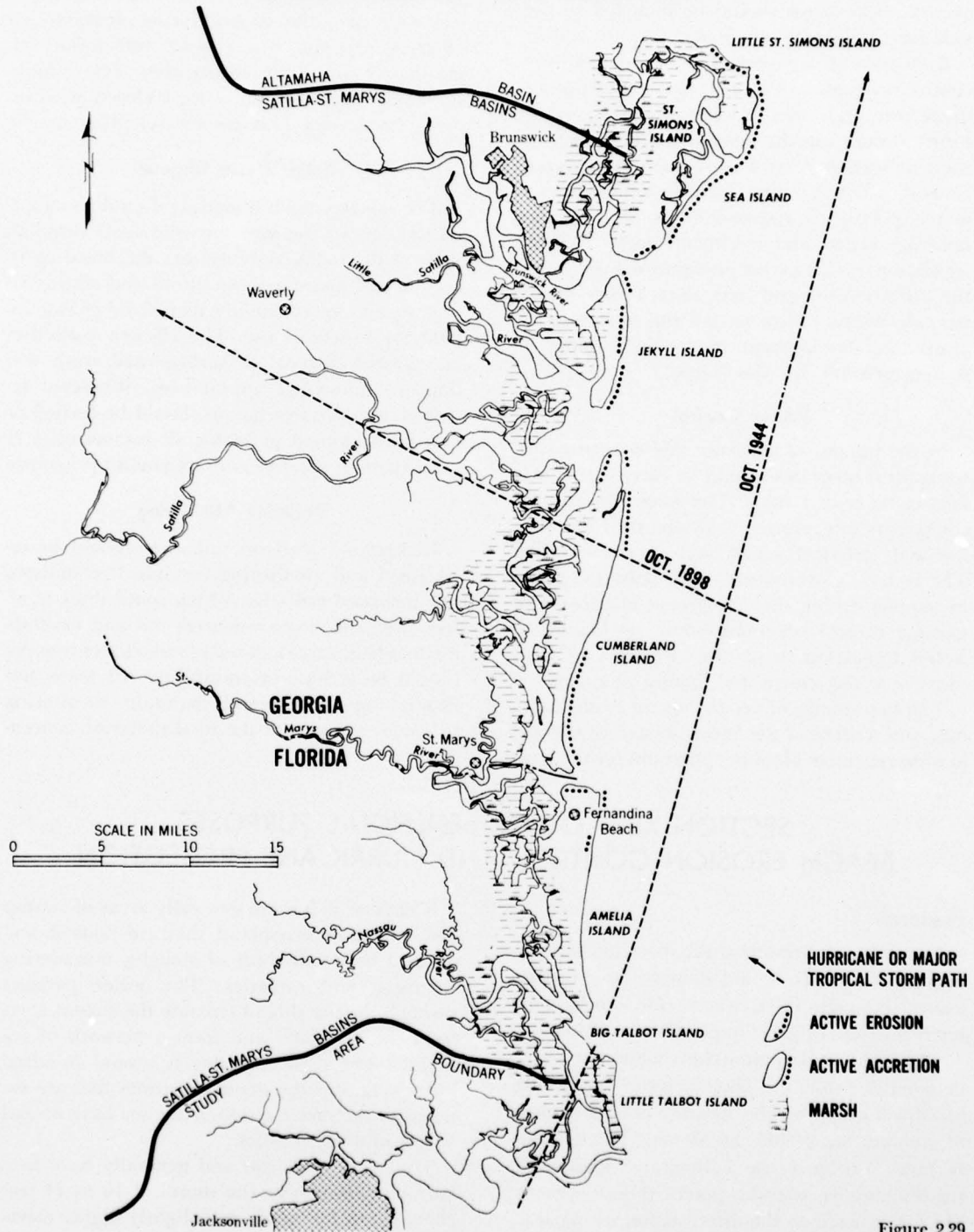


Figure 2.29

tions in the central areas. The ocean sides have trees and sandy beaches, and shrubbery covers most of the firm land. The lowlands to the rear are covered with marsh grass.

There are three islands north of St. Simons Sound, of which the largest is St. Simons Island, which is about 12.5 miles long and has an average width of 3.5 miles. Separated from it on the north and east by coastal marsh and a river is Little St. Simons with approximate dimensions of about 8 miles by 2 miles. Below Little St. Simons and east of St. Simons is Sea Island about 5 miles long by 2 miles wide. The east and south shores of St. Simons Island, including a considerable width of the area to landward, are built up with summer cottages, hotels, shops, and other developments incidental to a permanent and summer population. Jekyll Island, south of St. Simons Island and St. Simons Sound, is about 7 miles long with a maximum width of more than 2 miles. Most of the island is high ground covered with longleaf pine and live oak. The island is a highly developed, State-owned, public recreational resort and park.

Cumberland Island lies south of Jekyll Island and St. Andrew Sound. It is one of the two most outstanding undeveloped seashore areas remaining along the Atlantic and Gulf coasts. The island is about 22 miles long with a maximum width of 3.5 miles. The dunes reach a height of 55 feet.

Amelia Island, Florida, lies south of Cumberland Island and St. Marys River entrance into Cumberland Sound, which marks the boundary between Camden County, Georgia, and Nassau County, Florida. The island is 13 miles long and has a maximum width of about 2 miles. The city of Fernandina Beach and the main harbor area lie on the east bank of the Amelia River about 2 miles from the north end of Amelia Island. At the north end of Amelia Island the ocean shore beach is backed by a low ridge behind which is a sandy plain, thinly covered with grass, extending inland for about 2,000 feet. Along the inner edge of this plain are the main shore dunes 30 to 40 feet high and irregularly shaped.

Big Talbot Island, south across Nassau Sound from Amelia Island, is about 4 miles long and 1 mile wide. It is separated from Little Talbot Island on the east by a 2-mile wide series of

marsh and sandy ridges. Little Talbot Island is about 5.5 miles long and nearly 1 mile wide.

The beaches vary in width from a few feet to over 1,000 feet and have a shallow slope, averaging about 4 feet per mile. At one typical location, the beach is 400 feet wide when the water surface is at mean sea level. The crest of the berm and backshore area are 10 feet above mean sea level. The gently sloping beaches are generally wide and consist of fine and medium-size quartz sand from 0.05 to 51 millimeters.

The mean range of tides on the Georgia coast is approximately 7 feet. This is higher than the tides farther north or south. Tidal currents tend to scour and deepen existing channels and occasionally create new channels through the salt marshes. The effect of the tide is not limited to the salt-water areas. As the sea surface rises, it backs up the fresh-water flow in the streams for 10 to 20 miles beyond the reach of salt water. This causes the fresh-water zones of the streams to overflow and greatly expand the fresh-water swamps.

The shoreline of the coastal islands is exposed to the maximum effects of winds from the northeast, east, and southeast. The prevailing winds are generally from the southeast, but from September to November they are from the northeast. The average velocities of these northeast winds are from 10 to 12 knots, increasing on rare occasions to moderate gale force.

In general, the predominant direction of coast-wide currents and movement of material along the Georgia and Florida coasts is from north to south. There are local reverses resulting from the configuration of the shoreline and short-time reverses caused by changes in the direction of waves.

Existing Facilities and Programs

Beach Erosion Control

Some minor work has been done for beach erosion protection on Fernandina Beach, Amelia Island, and on the southerly end of St. Simons Island. However, there are no beach erosion control facilities of significance in the Satilla-St. Marys basins.

Hurricane Protection

Statistics are available for nine very destructive storms that have affected the Georgia coast-

TABLE 2.19
Georgia Hurricane and Major Tropical Storm Data¹

Date	Recorded maximum wind velocity (m.p.h.)	Pressure (in. of mercury)	Tide ht. ²	Loss of lives	Surge and wave damage (1,000)	Total damage (1,000)
Aug. 1881	---	29.08	20	³	\$300	\$2,000
Aug. 1893	72	28.31	22	1,500	2,000	4,000
Sept. 1896	75	29.00	---	25	400	3,000
Aug. 1898	76	29.23	---	---	100	1,000
Oct. 1898	60	29.46	B20	200	1,700	8,020
Aug. 1911	88	29.02	---	---	100	600
Aug. 1940	90	28.78	11	---	150	10,000
Oct. 1944	88	J28.94	12	---	300	460
Oct. 1947	95	28.77	11.5	---	200	2,000

NOTES: ¹ At Savannah, Georgia (except as noted)
B — At Brunswick, Georgia
J — At Jacksonville, Florida
² Tide height — feet above mean low water
³ Several hundred

line since 1881. Since 1757, there have been 70 severe storms on the Atlantic coast of the study area, some of which were not of hurricane intensity as usually defined. Of the 70 hurricane-type storms there have been 3 in June, 5 in July, 15 in August, 28 in September, 16 in October, and 3 others outside the June-October period. The coastline of the Satilla-St. Marys basins has not experienced hurricane-type storms as often as most of the remaining Atlantic coastline.

Needs and Opportunities

Beach Erosion Control

The history of the erosion and accretion periods of the shoreline for many hundreds of years can be read in the pattern of the beach ridges. The most recent story of the changes is available on maps and charts covering the last hundred years. Some movement of the shore has occurred on all the islands.

Hurricane Protection

It is estimated that a storm with the intensity of Hazel, the October 1954 hurricane, which killed 20 people and caused \$163 million worth of damages, could occur in the area between Jacksonville, Florida, and Cape Hatteras, North Carolina, once in 50 years. Such a storm could cross the coastline and strike any one locality in the Satilla-St. Marys basins once in 300 years.

The sea islands are subject to direct assault by hurricane wind, waves, and tidal surge. The best way to prevent the loss of human lives on these islands during a severe hurricane is to evacuate the public before an oncoming hurricane would endanger the lives of the people present or possibly cut them off from safe high land.

The Weather Bureau, in carrying out its responsibilities for improving hurricane warning service, has been cooperating with the Georgia State Civil Defense organization and local groups to develop operational procedures to reduce damage and loss of life from natural disasters.

Means of Meeting the Needs

Beach Erosion Control

Beach erosion protection can be accomplished by artificial placement of sand, possibly augmented in some cases by auxiliary structures. Artificial nourishment itself has the least adverse effect on a locality and appears to offer the best solution, providing a sufficient quantity of material for beach nourishment is near. Wind-erosion protection can be provided by vegetation or sand fences. Both are effective in forming and stabilizing dunes. Dunes act as barriers to high water and strong onshore winds, but they are more important as a source of beach material.

Substantial increase in erosion damage has occurred since the last comprehensive study of

the St. Simons Beach. Major changes have occurred also in the economic structure of the community and adjoining area. Many technical advances in beach erosion research and erosion control have evolved since the previous study in 1940. It is believed undesirable therefore, to consider the adoption of any of the prior plans of improvement, even with modifications, without a thorough and complete study of the existing conditions, their causes, and possible remedial measures which would provide protection for existing waterfront improvements as well as the remaining beach area.

At the northeast end of Amelia Island south of the jetty at Fernandina Beach, artificial nourishment is needed to control erosion and recession after the beach has been restored. Further studies are needed before a plan of improvement is adopted.

The Federal Government, through the Corps of Engineers, U. S. Army, cooperates with the States and other public groups in beach erosion studies. Because of the many factors involved in beach erosion and the possible effects of one beach upon another, no specific remedial measures can be proposed for the erosion problems of the Satilla-St. Marys beaches without such a study.

The recent advent of Federal assistance in hurricane protection has posed new problems in the development of coastal engineering criteria and has stimulated further research activity. There is a trend toward multiple-purpose planning in solving coastal problems. This involves coordinating stabilization, navigation inlet channel improvement and maintenance, and hurricane protection.

Coordinated projects of this type are likely to develop in the future along the Atlantic and Gulf shores where barrier beaches are prevalent.

Hurricane Protection

Individual recognition of the possible hazards is the most effective protection against hurricane damage. Structures should be located and built in order to minimize the possibility of damage. During the hurricane season—June through October—persons in exposed places should be alert to the weather announcements of the press, radio, and television.

In plans for development of the sea islands into concentrated residential or resort areas, consideration should be given to:

1. Adequate hurricane warning systems and evacuation routes.
2. Methods of reducing the potential danger or preventing additional future hazard areas by proper zoning, planning, and construction codes.
3. Protecting sewage-disposal facilities from flooding and preventing contamination of water supply.
4. Provision of auxiliary power supplies and alternative communication systems.
5. Protective seawalls or similar structures to reduce the danger of damage from high waves.

A desirable adjunct of the plan would be the establishment of an official State agency in Georgia on shore preservation and legislative provision for State participation in erosion studies and in construction of protective works. Such an agency and provision exists in Florida.

PART THREE – COMPREHENSIVE PLANNING

The procedures used in developing the comprehensive and coordinated plan are briefly summarized in the following four steps: (1) An inventory was made of basic resources and related developments within the basins; (2) needs for goods and services were projected to the year 2000 for the Satilla-St. Marys basins; (3) alternative ways to meet needs for each purpose were studied; and (4) projects and programs that would best serve all purposes and meet requirements for resource conservation, utilization, and development were selected.

The character and effect of plans in other basins were considered in connection with the formulation of the Satilla-St. Marys basins plan, and adjustments were made to permit optimum interbasin uses.

Throughout the planning process, many factors such as those associated with geology, hydrology, engineering practices, and social characteristics are expressed in economic terms for convenience in making comparisons. Additional information on planning and plan formulation is provided in the Planning, Economics, Hydrology, and Engineering and Cost Appendices.

SECTION I – OBJECTIVES AND GUIDELINES

Objectives and specific planning guidelines adopted to govern the study and Report are as follows:

(1) A coordinated comprehensive plan for the development of the land and water resources of the Southeast River Basins through the year 2000 will be presented in the Report.

(2) The comprehensive plan will be recommended to the Governors and legislatures of the States of the study area and to the President and the Congress for use as a guide for land and water resources development in the Southeast River Basins area.

(3) The plan will set forth an early action phase which will include projects and programs found to be needed, feasible, and desirable for accomplishment by 1975.

(4) It will be recognized that additional studies of recommended programs and projects may be required to support specific requests for State and Federal support and for development by private agencies.

(5) All of the purposes enumerated in the Act will be given equal attention. In the completed plan, each purpose will be developed to that level consistent with the needs and economic capacity of the individual basin. Treatment of industrial development will be limited generally to indications of the effects of the plan

on rates of development and to development implied in the projections of manufacturing employment. Recreation studies will be limited to public outdoor recreation related to land and water resources and to types beyond those normally provided by individuals and municipalities. Public health studies will be oriented toward determining the effects upon public health associated with the development of land and water resources.

(6) In determining the composition of the comprehensive plan, each separable component will be considered on the basis of the contribution that it makes in net benefits to the Satilla-St. Marys basins, the Southeast River Basins, and the Nation. When intangible considerations play a major part in the decisions affecting an element of the program, they will be explained as fully as possible in narrative form.

(7) The comprehensive plan will: Provide information on benefits and costs, including monetary and nonmonetary values; contain information on the expected economic impacts created by the recommended elements of the plan; include general recommendations on cost sharing, reimbursement, and project payout; designate whether recommended developments should be implemented primarily by non-Federal or Federal entities; and designate which of the

Federal agencies has the major responsibility for the Federal aspects of a project or program.

(8) The comprehensive plan will recognize and protect the rights and interests of individuals and of the States in determining the development of land and water resources and the preservation and protection of established uses.

(9) The comprehensive plan will include the existing, authorized, and formally proposed

works and programs of the Federal and non-Federal agencies with proposed modifications limited to those found desirable, feasible, and consistent with the study objectives.

(10) Recommendations will be made for periodic review of the comprehensive plan. This review will serve as a basis for keeping the plan current and for subsequent action.

SECTION II - PLANNING ASSUMPTIONS AND CRITERIA

Assumptions

The comprehensive plan is based upon a series of assumptions. The broadest of these are: (1) That the Nation is entering a period of relative stability in international relations with no worsening of the cold war and no widespread outbreak of hostilities; and (2) that throughout the period covered by the plan, to the year 2000, the Federal Government and non-Federal interests will cooperate in encouraging and implementing economic growth and development throughout all segments of society and all areas of the Nation.

Population Growth

Three principal assumptions concerning the rate of national population growth were adopted: (1) The present fertility level, 1955-57 average, will remain constant to sometime between 1975 and 1980, then decline to the 1949-51 level by 2005-2010; (2) there will be moderate declines in mortality rates to the end of this century; and (3) net migration from abroad will be constant at about 300,000 per year. State and area population estimates were made in conformance with the general assumptions, but special attention was given to conditions reflected by study and analysis of individual areas.

Economic Growth and Development

The assumptions concerning trends toward world peace and United States and regional population growths are paralleled by assumptions of upward trends in employment, production, consumption, and foreign trade. For planning purposes, the gross national product was projected to increase from about \$500 billion in 1960 to \$888 billion by 1975 and \$2,300 billion by the year 2000.

A continuation of the trend in the human diet toward more red meats and more of some fruits and vegetables is reflected in the projections and plans for food production and land use. It was assumed that per capita consumption of food would increase until about 1975 and then remain about constant.

In line with the general expansion of the national and regional economy, it was assumed that investment capital required to attain projected industrial growth and resource development will be available and that the education and technical skills necessary for an expanding industrial economy also will be available. It was further assumed, as a working procedure for preliminary studies, that land and water resources and electric-power supply would not be limiting factors in attaining the projected economy of the Satilla-St. Marys basins. It was recognized in the study of the Satilla-St. Marys basins that the economy of the basins is an integral part of the regional and national economies.

National and Regional Viewpoints

Because of the widespread effects of land and water resource development, a responsibility falls on all levels of government and on the private economy to participate in resource planning and in the execution of resource programs.

In developing the Southeast River Basins plan, national needs for food and fiber and for services are included at those levels warranted by the comparative advantage and existing economic potential of the Southeast River Basins area in relation to national resources and needs. Thus, the primary benefits shown for projects and programs provide a reliable index of project efficiency from the national point of view as well as

the principal measure of regional and local benefits. Secondary benefits and impact studies provide additional evidence of the regional and local effects of resource development.

In developing projects and programs in the Satilla-St. Marys basins plan, consideration was given to national policy guides pertaining to land and water resources development that have resulted from legislation and to administrative policies or decisions that have prevailed. Policy guides and statements of national objectives used are discussed in the technical appendixes.

Criteria

Price Levels

Price levels prevailing on or about January 1960 were used for evaluating all present and future benefits and costs, except that an adjustment was made in agricultural prices based upon an assumption of a long-range parity ratio of 89 between prices paid and prices received by farmers.

Interest Rates

An interest rate of $2\frac{3}{8}$ percent was used as far as practicable in analyzing costs and benefits in project formulation. In certain instances, benefits and costs were extracted from available data, and it was impractical to adjust this interest rate when the interest rate mix of the data was uncertain. The $2\frac{3}{8}$ percent interest rate meets the need for a relatively risk-free and inflation-deflation-free rate for use in evaluation of the economic effects of Federal resource projects and programs. For converting certain non-Federal costs and benefits to an annual equivalent basis, a $4\frac{1}{4}$ percent interest rate was used.

Life of Projects and Period Covered by Analysis

The period of analysis used in the studies for this Report was the economic life of each project or 50 years, whichever was the lesser. The possibility of a longer maximum period, up to 100 years, was considered in recognizing certain long-range effects of intangibles and other impacts, but effects beyond 50 years were not evaluated in monetary terms.

The plan was formulated to meet only those needs expected to develop to the year 2000, and the evaluations generally reflect no increase in use of facilities after the year 2000. Needs will

naturally continue to grow after the year 2000, and many of the proposed projects and programs, by adding facilities, will have the capacity to absorb some of the growth. The potential of the plan to meet needs that develop after the year 2000 has not been evaluated.

The assumptions and criteria used are considered conservatively low. If more liberal criteria had been used, such as a period of analysis of 100 years and an increasing need after the year 2000, the projects and programs included in the plan would appear even more favorable.

Basis for Comparison of Projects Effects

Comparison and evaluation of the proposed projects and programs in the plan were made to determine the most effective use of economic resources, such as land, water, labor, and materials. In this way, actions and opportunities throughout the economy form a check on what is economically justified in the way of new plans and efforts.

The value of the projects or programs included in the plan is computed on the basis of future conditions "with" the projects or programs included in the plan as compared to future conditions "without" the projects or programs included in the plan.

The future "with" conditions for individual project or program analysis include all development which would be expected to occur during the period of analysis with the project or program in existence.

The future "without" conditions include all developments that are existing or under construction as of January 1960 assuming adequate operation and maintenance of those developments. Technological gains not directly associated with the projects and programs in the basins plan were recognized as part of the "without" condition. It was assumed that no part of the project or program would develop in the absence of the project or program. This is not to deny that, in the absence of the comprehensive plan, other plans would develop which might include many features similar to those in the recommended plan.

Timing of Development

Plans covering long periods into the future provide for needs which have not yet developed.

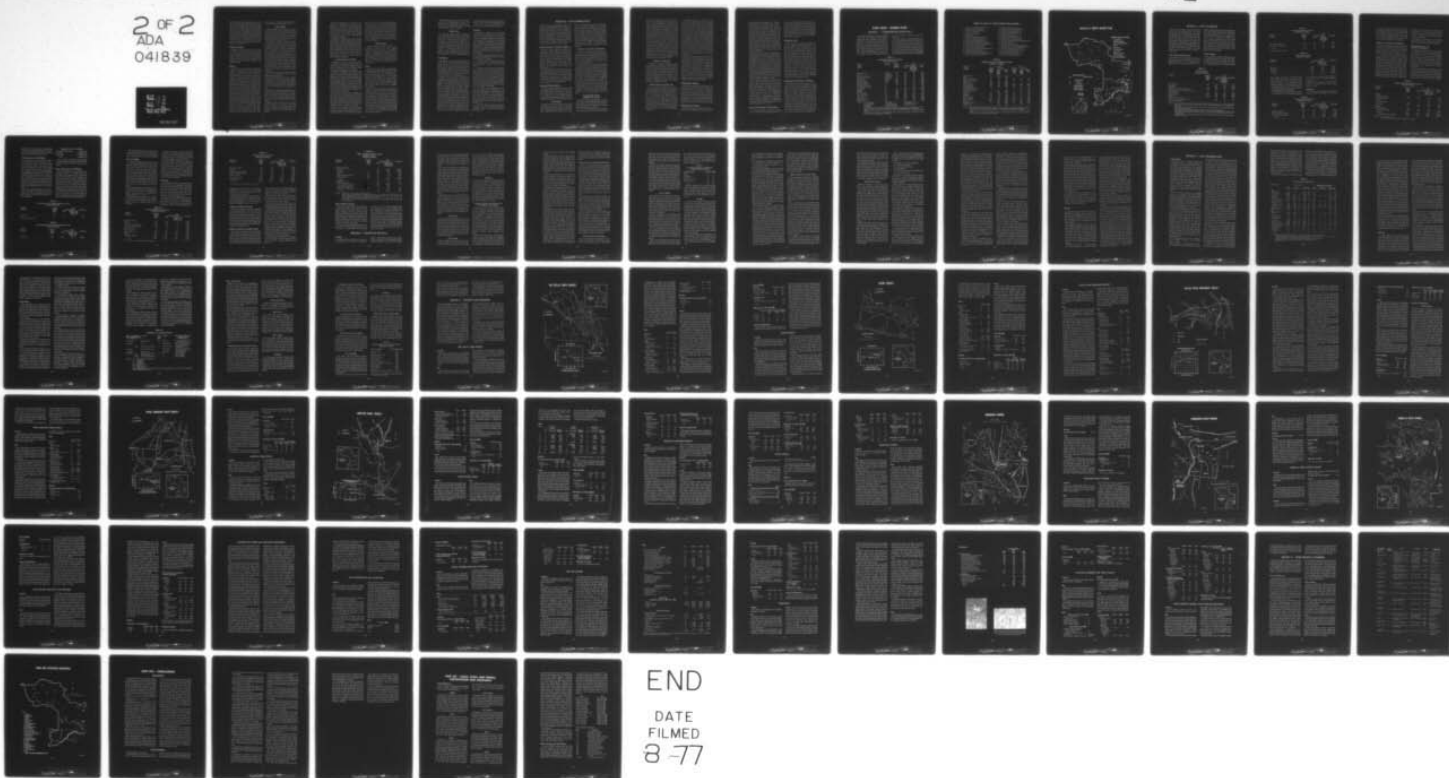
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UNITED STATES STUDY COMMISSION SOUTHEAST RIVER BASINS--ETC F/G 8/6
PLAN FOR DEVELOPMENT OF THE LAND AND WATER RESOURCES OF THE SOU--ETC(U)
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Not all developments are needed at once or at the same time. Plan implementation should, therefore, be scheduled to meet the needs as they occur. A precise schedule of year-to-year development was not considered necessary, but a general order of priority was established. Those developments needed first are included in an early action phase and are generally based on filling the needs to the year 1975. If need arises, however, projects scheduled in the 1975-2000 period may and should be initiated earlier. Likewise, the rate of project initiation may be slowed down if conditions warrant slower action.

Discount Principles

Program or project benefits and costs, which are estimated to accrue at different times and over varying periods of time, were converted to annual equivalent values by use of compound interest or discount rates. The resulting values reflect the present worth at the inception of each program or project and provide a common basis of measurement.

Benefits

The ultimate aim of resource projects and programs, in common with all other productive activity, is to satisfy human needs and desires. Goods and services are produced to achieve this end. These goods and services have value in accordance with the demand for them and their availability. Benefits are of two general kinds, primary and secondary. Primary benefits are the increase in the value of goods or services directly resulting from a project, less all associated non-project costs incurred in their realization. Primary benefits are usually evaluated at the first point in the chain of effects of a project where the goods or services produced have an actual or estimated market value. Secondary benefits are the value of goods and services created in secondary activities affected by the project, less all associated costs incurred in their realization. The major part of the value of these goods and services is not measured from the national public point of view because it is assumed that an investment similar to that made in the project would create a similar effect in secondary activities if invested in other projects or other areas. However, overall secondary benefits are consid-

ered appropriate in illustrating the significance of projects from a regional point of view.

Primary Benefits

Primary tangible benefits, which in this Section are referred to as primary benefits, represent the estimated increase in the value of the actual goods, services, and satisfactions of a project or program expected for the period under study and from which any induced losses to other projects or programs have been deducted.

The primary benefits from drainage and flood-loss prevention, resulting from the upstream watershed projects, are derived from net values for expected changes in land use, the increased productivity of land, the reduction of direct damage to agricultural crops and fixed improvements, and reduction of management costs.

Justification of the facilities included in the plan for drainage, irrigation, and soil conservation are based on the increased net return to the farmer from the estimated production response.

Primary benefits from the forestry program are estimated as the net stumpage value of increased production and the net leasing values received from the increased number of faces expected to be worked for production of gum-naval stores.

The primary benefits of the commercial fishery program are the estimated value of increased landings of commercial fish.

Primary benefits from the sport fish and wildlife programs are the estimated value of projected increases in user-days of hunting and fishing.

Benefits used in the monetary evaluation of the recreation program consist of the estimated value of increased user-days of recreational activity.

The benefits for domestic, municipal, and industrial water supplies are assumed to be at least equal to the cost of obtaining water of similar quality and quantity from the cheapest alternative source and are evaluated in monetary terms only for water supply storage in multiple-purpose reservoirs.

Primary benefits of flood control are derived from the difference in flood losses "with" and "without" protection. For upstream watershed and local protection projects, enhancement and restoration benefits are also included where applicable.

Benefits of navigation are taken to be the savings in rate differential; the savings in shipping time; the reductions in operation and maintenance costs; the value of any filled land obtained through spoiling; and, for new deep-draft harbor facilities, the increased gross revenues (increased costs associated with cargo handling are included as project costs); and savings due to use of larger tankers.

Justification of programs for vector control, solid-waste collection and disposal, air pollution and radiation monitoring, and pollution abatement except storage for augmenting low stream-flows is found in intangibles. In multiple-purpose projects including storage to provide for low-flow augmentation, the pollution abatement benefits were taken as equal to the average cost of the tertiary treatment to provide the same improvement or protection of water quality as that obtainable by dilution.

Secondary Benefits and Impacts

Although for purposes of this study a monetary evaluation of secondary economic effects of various resource projects and programs was not made, the importance of these secondary effects of resource development was recognized.

The projects and programs involving increased production of commodities would require additional raw materials, processing equipment, and more services to sustain the processing operation. These increased activities would extend throughout the basins. Trades and services especially would be stimulated by recreation, sport fishing, and wildlife developments. These impacts would particularly affect fishing camps, marinas, commercial boat docks, motels, sporting goods stores, service stations, boat dealers, restaurants, and many related new businesses.

Construction projects create a temporary influx of workers who spend money in local areas but, at the same time, such projects will create problems of housing, schooling, transportation, and other community services. The solution of these short-term problems should result in long-range gains with construction of facilities that would be needed to meet future expansion.

There are two counties located wholly or partially in the Satilla-St. Marys basins which have been designated redevelopment areas as of April 1962 by the Area Redevelopment Adminis-

tration of the U. S. Department of Commerce. These counties have been so designated because of varying reasons such as low income and low farm family income. Execution of the plan for the basins would assist in the relief of these conditions and aid in raising the economic level of the people. Substantial net secondary benefits are most frequently realized in areas where resource development projects make it possible to utilize unemployed and underemployed labor and unused facilities.

Intangible Benefits

Intangible benefits are those which are not evaluated in monetary terms. Like tangible benefits, these may be primary or secondary in character. Many programs and projects make substantial contributions to public security, to private and public health, and to public safety and tranquility, all of which include large elements of intangible values. Intangible benefits and costs are recognized in programs and projects analyses.

Costs

Costs are the value of labor, goods, and services exchanged to gain goods and services valued more highly. Where the costs are tangible values, the assumption is made that the needs of the project are taken from present uses at marginal unit prices and, therefore, the values foregone represent the least important uses that the market would allow. In a resource program as complex as that recommended for the Southeast River Basins, there are also many intangible costs involved.

The costs of proposed projects and programs include the initial investment which would be incurred in one or more stages of construction and the annual expenditures required for operation, maintenance, and replacements. Investment costs include the capital expenditures associated with constructing a project and carrying out a program. However, interest during construction is omitted where the period of construction was not expected to exceed 2 years. Where the period of construction was estimated to be more than 2 years, the investment included simple interest on one-half of the construction costs for the period of construction.

Capital investment and operation and maintenance costs of multiple-purpose projects were allocated to the several purposes served so as to form a basis for reimbursement and cost-sharing arrangements that may be required.

Intangible Costs

In evaluating resource programs and projects, many important program and project effects cannot be adequately measured in monetary terms. Loss of scenic values is an example of an intangible cost frequently associated with resource development. Treatment of these intangible effects has been subjected to many of the requirements applicable to tangible effects. These include: (1) Considering effects in terms of difference "with" the project and "without" the project, and (2) considering intangible costs to the same degree or extent as intangible benefits.

Cost Sharing

Cost sharing is concerned primarily with the distribution of costs among the participating interests. The division of cost is shown in two groups: Federal and non-Federal. For each specific project or program, the actual division of cost among the Federal and non-Federal interests was determined by the nature of the development and on the basis of circumstances expected to prevail during the evaluation period.

Generally, where the impacts of projects and programs are largely local, the costs are the responsibility of non-Federal interests. Projects and programs of national significance are the responsibility of the Federal Government. Between these two extremes there are a number of projects and programs where the costs are to be shared by the Federal and non-Federal groups.

In determining the degree of Federal participation in programs and projects of less than national significance, consideration was given to: (1) The need for demonstrating new approaches to resource development and use; (2) the usefulness of a local project or program in research and experimentation which has more than local implications; (3) the support of projects or programs which by policy or legislation have become accepted as Federal or part Federal responsibilities, such as flood control; and (4) the

possible justification for Federal participation in the cost of local works and improvements where counties, areas, or regions are designated as distressed and in need of economic assistance.

Financing

Determination of effective ways for financing land and water development is an essential part of resource planning. Financing as used here relates to the immediate source of funds needed for construction and management of proposed works. Financing requirements were developed only as Federal and non-Federal although in the analyses State, county, municipal, and private financing were considered. Special groupings for purposes of financing, such as development corporations and special improvement districts, are also involved.

The following criteria were used in determining appropriate methods for financing land and water resource developments.

(1) Developments of natural resources that do not involve national consideration will be the responsibility of private, local, and State interests.

(2) Where the costs of projects and programs are to be shared between the Federal and non-Federal interests, each will provide for the financing of its share, except as noted under item (3) following. The Federal share will be provided under such laws and regulations as are applicable at the time of financing. In addition to direct government and private appropriations for the non-Federal share, development funds, authority funds, special bond issues, and revenue bonds are available for financing.

(3) For projects such as hydroelectric power and water supply, Federal financing may be needed, with provision for reimbursement from non-Federal beneficiaries, as is now practiced. Federal financing may also be required for projects of the types not adequately covered by traditional approaches. This includes large-scale recreation projects and some types of fish and wildlife work.

(4) When the Federal Government assumes the full cost of a project or program, the Federal Government will be responsible for full financing of the work.

SECTION III - PLAN FORMULATION

Selecting and fitting planning segments together and considering alternatives in the search for the proper programs, the proper number of projects, and the best size for each element of the overall plan required extensive analysis. By a series of approximations using the incremental approach and limited by consideration of alternatives and judgment, a plan was formulated containing those programs and projects that will usually result in maximum benefits above the costs in meeting needs to the year 2000.

General Character of Resource Planning

Generally, resource planning recognizes the consequences of land and water resource development and the need to anticipate the future requirements for land and water essential to growth and welfare. The physical and economic aspects of the planning task have been emphasized, particularly as they relate to the scale, sequence, and timing of development plans. However, these considerations have been tempered by the recognition of social, legal, and political factors.

The plan has been developed on the basis that free enterprise persists in the area and the Nation with Federal and State Governments undertaking those tasks which are beyond individual or voluntary group capacity or which require such action for special physical, economic, social, or other reasons. Local and regional viewpoints were recognized in formulating the plan.

Guides for Plan Formulation

A number of general land and water resource development guides and planning aids were used in weighing and selecting those alternatives which were fitted into an effective plan. In all cases, the effective use of these guides and planning techniques required careful adherence to the assumptions and criteria outlined in Section II.

Plan Evaluation

Comparison of benefits with costs was one of the principal guides used in plan formulation. These comparisons attempted to cover all beneficial and adverse effects. While favorable primary tangible benefit-cost relations were gener-

ally the principal basis used in selecting programs and projects, intangible costs and benefits were also considered in making the plan. Measurements made reflected existing and probable future economic conditions, including estimates of the probable needs for the many goods and services which land and water development make possible. Benefit-cost data were applied to a range of interdependent physical and social possibilities and the resulting scale used for judging and selecting the means of development, the scope of facilities needed, and the site or area involved.

Increments and the Scale of Development

To achieve a reasonable scale of development, it was necessary in the formulation process to divide the work into manageable units. Planning units, usually called separable segments or increments, were the smallest units on which there was a practical opportunity for inclusion in or omission from the plan.

To meet the general objectives of maximizing net economic returns and satisfactions from the economic resources used in the plan, each part of the plan was formulated to include each separable segment or increment which would provide benefits at least equal to the cost of that segment or increment with full consideration of intangible values. Plan formulation was completed when analyses demonstrated that (1) there was need for the goods and services produced, (2) total benefits exceeded total costs, (3) each separable segment or purpose provided benefits at least equal to its cost, (4) the scale of development was such as to provide the maximum net benefits, and (5) there were no more economical means of accomplishing the same purposes.

The Nucleus Plan and the Multiple-Purpose Concept

A specific initial proposal generally was chosen as the nucleus around which planning proceeded. This nucleus usually represented a project or program which seemed to offer promise of meeting a major objective or objectives.

After the initial proposals of development were selected for analysis and benefits and costs

measured, consideration was given to larger or smaller scales of development. Variations in the scope of each separable increment were made and tested, and the possibility of additions or omissions examined. Early in this process, the possibility of multiple-purpose projects was considered. By the process of elimination, the most promising combination of projects and programs was identified and tested to determine where a justified nucleus had been found. The incremental analysis was continued by adding segments of size, purpose, or means, and by evaluating the resulting increments of benefits and costs. Thus, the incremental analysis was a series of comparisons of alternative plans "with" and "without" the inclusion of particular segments. Short cuts were frequent and necessary but those principles were followed. By this fitting process, modifications were made in the initial plan. This process was continued within practical limitations until the best combination was evolved to meet the established needs.

Sequence of Development

The sequence of project development is basic to maximizing overall project benefits. Project benefit and cost comparisons are misleading unless they represent the incremental benefits and costs of projects in a specified sequence of development. This problem was recognized in the studies by dividing proposed developments into those requiring early action and those which could be accomplished by later action. Further refinement in timing could lead to some changes in incremental benefits and costs.

General Information and Basic Data

Much of the general information essential to resource planning in the Satilla-St. Marys basins was available, but it was seldom in the degree of detail or form needed for planning. It was necessary to rework much of the published data to get it to fit with the basins area. While little original research was undertaken, professional interpretation of data and problems was sought in the planning process. The extensive data on existing and current programs and resource plans of Federal, State, and, to some degree, private agencies became a part of the basic planning information.

A problem repeatedly encountered in the studies was the lack of basic data. Topographic maps with a contour interval of 10 feet or less are available for about 50 percent of the basins. The best maps cover the area located primarily near the coast. Many of the inland maps have a horizontal scale of 1 inch equals about 20,800 feet and a contour interval of 50 feet. Geological and soil data were based on generalized geology and reconnaissance observations. Streamflow data are available at two places on the main stream of the Satilla River and in five of its tributaries. Similar data are available at one place on the St. Marys River and for four of its tributaries. No streamflow data are available for the Nassau River. Part of the basins streamflow data covers only a few years and all of it is for less than a 34-year period as of 1960. There is, also, a lack of data on water quality for many of the streams in the basins.

Pertinent economic statistics other than those developed by the Commission have been less than adequate, except during the last few years. The lack of data can be attributed largely to the fact that the basins have never approached full development of their resources. Consequently, there has been minimum effort to collect data. However, more competition for resource use is beginning to arise, and selection between uses will be increasingly important as the demands increase. Good basic data are essential to making proper selections, so steps need to be taken promptly to insure that the information will be available when it is critically needed.

Single-Purpose Planning

Single-purpose planning for each purpose was carried to the point of establishing needs and determining most likely ways of meeting the needs with the least expenditure of resources. Studies for some purposes were carried into more detail than others in examining alternative ways of meeting needs. Where it was apparent that a single-purpose plan could be used without major modification in the comprehensive plan, the single-purpose studies were carried to more detail.

Multiple-Purpose Planning

Information developed in single-purpose planning and the special problems of the area were

the initial bases for development of a multiple-purpose plan for the Satilla-St. Marys basins.

The programs and projects which served as nuclei for the initial planning were based on the character of the resources, and nature of the problems, and the nature of the land and water projects already established or planned as portrayed in the single-purpose plans. Proposals considered for the inclusion in the plan came from many sources. Citizens throughout the area and local development organizations expressed interest in projects of many kinds and suggested combinations of resource use and development which they believed would meet particular needs. Federal and State agencies were also the source of much information on possible projects and project combinations.

Consideration was given to complementary land and water uses. Following the development of single-purpose ways for meeting needs, studies of compatible resource uses and areas of potential conflict in resource use were made. It was found that needs for forestry, recreation, and fish and wildlife could frequently be met by proper utilization of the same land resource. Similarly, water resource development plans could acceptably serve the purposes of flood control, hydroelectric power, water supply, fishing, and recreation, although operating adjustments had to be considered so that the most favorable multiple-purpose operating arrangements could be assured to maximize overall net benefits.

When sufficient preliminary study had been made, a series of detailed studies were undertaken to choose from among the alternatives those filling the needs most effectively. In this process, the problem of deciding among competing uses sometimes arose and there was always present the need to seek arrangements whereby the greatest play of complementary values would occur. This process involved a repetitious series of adjustments, in varying degrees of refinement, combined with progressively refined economic, hydrologic, and engineering comparison, until the best combination of proposed developments was found.

Nature and Treatment of Alternatives

In resources planning, comparison of alternatives is a vital part of the planning process. It

is necessary to understand the nature of projects and programs rejected and the reasons for rejection, as well as the character of those accepted in the plan. Information on alternatives considered is summarized in Part Four. Additional detail concerning the nature of the alternatives considered and the reasons for their acceptance or rejection in the final plan is included in Appendix 12, Planning.

Competitive Uses

Many resource uses are competitive in character. The principal guidelines established and generally followed in determining the use of land and water resources are summarized as follows: (1) Resource utilization was based on and limited to the projected future needs, and (2) economic efficiency was a major governing criterion in deciding between alternative uses of a given resource, with due consideration given to social, political, and physical factors. Some of the situations requiring special attention are: (1) Existing, reserved, or special use land and water resources; (2) public health; (3) special requirements involving areas that provide a particular type of land or water use that cannot be duplicated elsewhere at a reasonable cost; and (4) those resources to which priority considerations should be given because of long established or firmly fixed development trends.

Adjustment Among Basins In Planning

Interbasin relations were recognized, to the extent practicable, when Southeast River Basins needs were developed and distributed among basins to provide planning objectives for each basin. For example, user-days of recreation demand for a given population center were distributed to all basins within reasonable travel distance from the center rather than being allocated exclusively to the basin within which the center lies. A check was made to insure that the overall cost of meeting each need was not inflated by unreasonable disparities in unit costs. Adjustments between the Satilla-St. Marys and other basins were made where reasonable alternatives were available and where overall efficiencies could be improved by the adjustments.

PART FOUR - BASINS PLAN

SECTION I - COMPREHENSIVE BASINS PLAN

The comprehensive plan for the development, conservation, and utilization of the land and water resources of the Satilla-St. Marys basins is comprised of existing and proposed projects and programs to meet the needs of the basins projected to the year 2000. Projects and programs included in the plan, in addition to those existing in 1960, are shown in the following tables. More detailed information pertinent to project and program accomplishments, economic analysis, physical features, and implementation of

the plan is included in subsequent sections of this Report.

The plan includes continuing programs such as those for public health and soil conservation and utilization that are carried on from year to year and individual projects which involve relatively large but short-term construction expenditures that will have benefits accruing over many years. Many programs are already underway and expected changes involve intensity or magnitude of development rather than type of development.

TABLE 4.1
Comprehensive Plan for Development
(thousands of dollars)

Project or program	Purpose ¹	Benefits Annual equivalent ²	Costs		Invest- ment
			Annual equivalent Total	Operation, maintenance, and replace- ments	
Big Satilla Creek	R,F&W,I	978	430	139	8,440
Axson	R,F&W,PA,I	714	269	82	5,290
Nassau River Embayment	R,F&W,FC,PH	890	226	85	3,900
Upper Hurricane Creek	R,F&W,PA,I	421	255	64	5,270
Broxton Creek	R,F&W,PA	363	128	40	2,430
Water-access areas	R,F&W	3,999	1,031	647	10,630
Upstream watersheds	FC,D	2,894	702	167	14,780
Brunswick Harbor	N	683	858	474	8,910
Fernandina Beach Harbor	N	375	324	236	1,830
Umbrella Creek Channel	N	8	6	1	150
Water supplies	WS	4	3,265	2,592	22,500
Irrigation ³	I	1,968	1,045	873	4,780
Drainage ³	D	580	29	20	256
Soil conservation	SC	920	672	357	8,715
Forest conservation	F	4,051	1,989	880	46,650
Fish and wildlife ³	F&W	2,428	1,567	1,478	3,270
Recreation ³	R	16,180	3,898	2,204	58,940
Pollution abatement ³	PA	5	673	186	20,900
Public health ³	PH	5	509	501	400

NOTES: ¹ FC—Flood control
WS—Water supplies
N—Navigation
I—Irrigation

D—Drainage
SC—Soil conservation
F—Forest conservation
F&W—Fish and wildlife

R—Recreation
PA—Pollution abatement
PH—Public health

² Primary tangible only; intangible and secondary benefits and impacts considered are presented in narrative.

³ Data presented are exclusive of costs and benefits associated with multiple-purpose developments.

⁴ Benefits are assumed to be at least equal to the cost of the cheapest alternative but are not assigned monetary values.

⁵ Justification is based largely on intangible benefits, except for pollution abatement resulting from dilution water provided by multiple-purpose developments.

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TABLE 4.2
Comprehensive Plan for Development by States
 (thousands of dollars)

Project or program	Georgia			Florida		
	Benefits	Costs		Benefits	Costs	
	Annual equiv- alent ¹	Total annual equiv- alent	Invest- ment	Annual equiv- alent ¹	Total annual equiv- alent	Invest- ment
Big Satilla Creek	978	430	8,440	---	---	---
Axson	714	269	5,290	---	---	---
Nassau River Embayment	---	---	---	890	226	3,900
Upper Hurricane Creek	421	255	5,270	---	---	---
Broxton Creek	363	128	2,430	---	---	---
Water-access areas	3,043	791	8,180	956	240	2,450
Upstream watersheds	600	320	6,620	2,294	382	8,160
Brunswick Harbor	683	858	8,910	---	---	---
Fernandina Beach Harbor	---	---	---	375	324	1,830
Umbrella Creek Channel	8	6	150	---	---	---
Water supplies	3	2,651	20,100	3	614	2,400
Irrigation ²	1,772	929	4,247	196	116	533
Drainage ²	520	25	223	60	4	33
Soil conservation	738	531	7,160	182	141	1,555
Forest conservation	3,079	1,512	35,690	972	477	10,960
Fish and wildlife ²	1,236	991	2,540	1,192	576	730
Recreation ²	11,400	2,867	44,230	4,780	1,031	14,710
Pollution abatement ²	4	527	16,360	4	146	4,540
Public health ²	4	412	400	4	97	---

NOTES: ¹ Primary tangible only; intangible and secondary benefits and impacts considered are presented in narrative.
² Data presented are exclusive of costs and benefits associated with multiple-purpose developments.

³ Benefits are assumed to be at least equal to the cost of the cheapest alternative but are not assigned monetary values.

⁴ Justification is based largely on intangible benefits, except for pollution abatement resulting from dilution water provided by multiple-purpose developments.

SATILLA-ST. MARYS BASINS PLAN

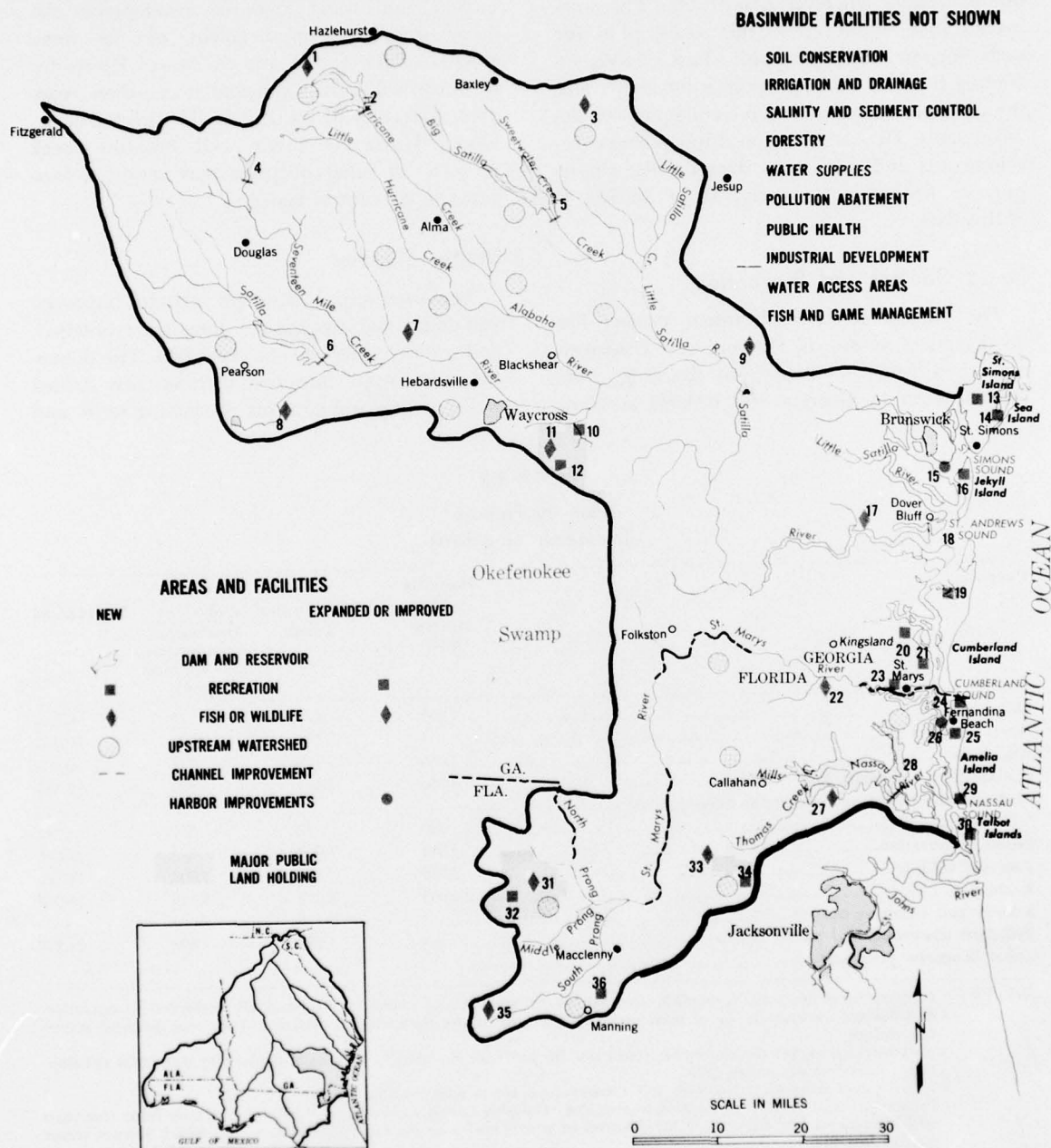


Figure 4.1

SECTION II - PLAN BY PURPOSE

Many of the proposals in the plan involve benefits and costs associated with more than one purpose. The plan is designed to meet needs of many purposes; it takes advantage of joint-use efficiencies wherever practicable. The summaries that follow cover the entire plan for each purpose listed in Public Law 85-850, including both its single-purpose components and the allocated share of the multiple-purpose developments. Details of the multiple-purpose developments and additional data for the single-purpose proposals are included in Section V of this Part.

Flood Control and Prevention

The Nassau River Embayment project has flood control as one of its purposes. Upstream watershed projects on streams draining some 600,000 acres in Georgia and 600,000 acres in

Florida would include floodwater retarding structures, channel improvements, land stabilization, and land treatment structures. These features would provide flood prevention, watershed protection, and water resource development for other purposes. Improvement of the main reaches of the Satilla and St. Marys Rivers for flood control is not warranted at this time. However, operation of the Big Satilla Creek, Axson, Upper Hurricane Creek, and Broxton Creek projects for other purposes may result in incidental flood control benefits.

Water Supplies

The water supply program includes improved and additional supplies for domestic, municipal, and industrial uses to the year 2000. The domestic water supply program includes new drilled wells, sealing and covering of existing wells, and

TABLE 4.3
Plan by Purpose
(thousands of dollars)

Purpose	Benefits Annual equiva- lent ¹	Costs		
		Annual equivalent Total	Operation, maintenance, and replace- ments	Investment
Flood control	1,363	326	79	6,880
Water supplies	2	3,265	2,592	22,500
Navigation	1,066	1,188	711	10,890
Reclamation, irrigation, and drainage	4,136	1,484	990	13,636
Hydroelectric power and industrial development ³	---	---	---	---
Soil conservation	920	672	357	8,715
Forest conservation	4,051	1,989	880	46,650
Fish and wildlife	3,679	2,101	1,602	14,600
Recreation	21,655	5,553	3,116	79,980
Salinity and sediment control	4	4	4	4
Pollution abatement and public health	5	1,298	699	24,190
Other beneficial purposes ⁶	---	---	---	---

- NOTES: ¹ Primary tangible only; intangible and secondary benefits and impacts considered are presented in narrative.
² Benefits are assumed to be at least equal to the cost of the cheapest alternative but are not assigned monetary values.
³ Hydroelectric power developments could not be justified. No specific proposals in plan for industrial development; narrative discussion only.
⁴ Benefits and costs included with soil conservation, forest conservation, and flood control.
⁵ Project justified largely on basis of intangibles. Tangible benefits amounting to \$582,000 accrue from reservoirs which augment low streamflow for dilution of wastes and from Nassau River Embayment which accrues vector control benefits.
⁶ Additional studies are necessary for beach erosion control and hurricane protection but no regular program is included in the plan.

TABLE 4.4
Flood Control Benefits and Costs
(thousands of dollars)

Project or program	Benefits Annual equivalent	Costs*	
		Annual equivalent Total	Investment Operation, maintenance, and replacements
Upstream watersheds	1,323	295	6,260
Nassau River Embayment	40	31	620
Total	1,363	326	6,880

*Costs allocated to flood control.

TABLE 4.5
Water Supplies Costs
(thousands of dollars)

Project or program	Costs		Investment
	Annual equivalent Total	Operation, maintenance, and replacements	
Domestic	166	48	3,940
Municipal	1,480	1,097	16,470
Industrial	1,619	1,447	2,090
Total	3,265	2,592	22,500

power pumps and pressure systems. This program would provide about 4.4 million gallons of water per day. The municipal water supply program includes source improvement, treatment, elevated storage, and enlarged distribution systems. It would serve about 273,000 people in 27 municipal systems and would provide about 54 million gallons of water per day.

The industrial water supply program includes new wells and new water handling equipment

or the expansion of existing water systems. It would provide about 329 million gallons of water per day.

Benefits for the domestic, municipal and industrial water supply programs are not shown in monetary terms.

Navigation

The navigation developments proposed are wharf and channel enlargements of the deep-

TABLE 4.6
Navigation Benefits and Costs
(thousand of dollars)

Project or program	Benefits Annual equivalent	Costs	
		Annual equivalent Total	Investment Operation, maintenance, and replacements
Brunswick Harbor	683	858	8,910
Umbrella Creek Channel	8	6	150
Fernandina Beach Harbor	375	324	1,830
Total	1,066	1,188	10,890

water ports at Brunswick, Georgia, and Fernandina Beach, Florida, and restoration of the channel in Umbrella Creek near Dover Bluff, Georgia. While the primary tangible costs exceed the primary tangible benefits for the Brunswick Harbor, the large intangible benefits which would accrue make the improvements justified.

Reclamation, Irrigation, and Drainage

Most of the agriculture programs included in the plan involve individual or group actions by the farm owners or operators and would be financed largely by them. Woodland drainage is included in the forest conservation program.

It is estimated that about 33,200 additional acres of cropland will be irrigated by individual sprinkler systems on individual farms by the year 2000. Principal crops to be irrigated include tobacco, corn, cotton, peanuts, orchards, truck, and other specialty crops. Water supply requirements will be provided by farm ponds, Big Satilla Creek, Axson, and Upper Hurricane Creek reservoirs, individual wells, and streams. It is estimated that about 19,700 additional acres of cropland and pastureland will be drained by individual landowners installing onfarm and small group drainage facilities by the year 2000.

Principal crops to be grown on drained lands include tobacco, corn, cotton, peanuts, and truck and other specialty crops. Practices include construction, enlargement, and improvement of open-drainage ditches.

The upstream watershed projects will include channel improvements which provide for drainage in combination with flood prevention.

Hydroelectric Power and Industrial Development

Developments for hydroelectric power could not be justified alone or as a purpose in multiple-purpose projects. The power needs of the basins will continue to be met by new and expanded facilities inside and outside the basins. The distribution system will be expanded as required. By the year 2000, the basins electric energy requirements are expected to be about 5.4 billion kilowatt-hours with a demand of some 1.0 million kilowatts.

Industrial development will increase in the basins and be enhanced by the resources development plan outlined in this Report. Manufacturing employment projections for the basins show increases in all manufacturing categories by 2000 except textiles which are expected to decline

TABLE 4.7
Irrigation and Drainage Benefits and Costs
(thousand of dollars)

Project or program	Benefits Annual equiva- lent	Costs		Invest- ment
		Total	Operation, main- tenance, and replacements	
Irrigation				
Irrigation programs	1,968 ¹	1,045	873.0	4,780
Big Satilla Creek ²	3	1	0.1	30
Axson ²	3	1	0.1	20
Upper Hurricane ²	11	1	0.2	30
Subtotal	1,985	1,048	873.4	4,860
Drainage				
Individual farm	580 ¹	29	19.7	256
Upstream watershed ²	1,571	407	97.0	8,520
Subtotal	2,151	436	116.7	8,776
Total irrigation and drainage	4,136	1,484	990.1	13,636

NOTES: ¹ Annual returns to farmers.

² The costs given are those allocated to irrigation and drainage.

slightly. Most of these increases in employment are small, but fairly substantial increases are projected for pulp and paper products, food processing, chemicals, apparels, and metals.

Soil Conservation and Utilization

The program for soil conservation and utilization involves local, state and Federal interest. It is expected that about 178,300 acres of additional cropland, pasture, and range will be treated by installation of annual and enduring soil conservation measures by the year 2000. These measures will include the establishment or reestablishment of vegetative cover, reduction of overgrazing, protection from fire, erosion control, and management of soil, water, livestock, and vegetation. It is estimated that about 2,900 additional farm ponds will be installed to provide water for livestock and irrigation and, in addition, would provide for some of the small impoundment fishing demands and recreation needs.

It is estimated that 85,000 acres of woodland, pasture, and other land will be converted to cropland, and that some 98,000 acres of cropland, woodland, and other land will be converted to pasture.

Expected Land Use in Year 2000

Cropland and pastureland	465,000 acres
Woodland	2,542,000 acres
Other land	420,000 acres
Total	3,427,000 acres

Most of the soil conservation and utilization measures included in the plan involve individual or group actions by the farm owners or operators.

Forest Conservation and Utilization

The 1959 woodland area of 2,716,000 acres is projected to decrease to 2,542,000 acres by the year 2000. The program for forest conservation and utilization, however, will be applied on all existing woodlands until they are converted to other land uses, because of the uncertainties of determining the specific areas which will eventually be taken out of woodland. The program includes fire protection, grazing control, tree planting, water control and forest roads, timber stand improvement, management and utilization of the woodlands, and other measures. The program would provide for an annual timber cut of some 180 million cubic feet and production of about 320,000 barrels of gum-naval stores.

TABLE 4.8
Soil Conservation and Utilization Benefits and Costs
(thousand of dollars)

Project or program	Benefits Annual equiva- lent*	Costs		
		Total	Annual equivalent Operation, main- tenance, and replacements	Investment
Basinwide	920	672	357	8,715

*Annual returns to farmers.

TABLE 4.9
Forest Conservation and Utilization Benefits and Costs
(thousand of dollars)

Project or program	Benefits Annual equiva- lent	Costs		
		Total	Annual equivalent Operation, main- tenance, and replacements	Investment
Basinwide	4,051	1,989	880	46,650

The forestry program will be developed, financed, and administered by the timber owners with some Federal and State participation in fire prevention and other aspects of the program.

Fish and Wildlife

The fish and wildlife program involves local, State, and Federal developments. The wildlife program extends throughout the basins and includes improvement of existing wildlife management areas, development of six new management areas, and extensive habitat development. The sport fishing program includes the improvement of existing streams; the renovation and more intensive management of existing lakes and impoundments; the improvement of present access areas and development of new access areas to the rivers, new and existing reservoirs, and coastal waters; and new separate salt-water facilities.

The commercial fisheries program includes expansion of existing operations, rehabilitation of the oyster fishery, cultivation of high-quality seafoods, and acceleration and expansion of existing facilities and activities.

Accomplishment of the plan by the year 2000 is estimated to provide annually some 469,000 user-days of hunting, 1,740,000 user-days of sport fishing, and about 91.4 million pounds of commercial fish.

Programs installed in the period 1960-2000, by the end of the period, would provide for an annual increase of 268,000 user-days of hunting, 1,163,000 user-days of sport fishing, and about 49.1 million pounds of commercial fish.

Fish and wildlife is included as a purpose in the projects at Big Satilla Creek, Axson, Nassau River Embayment, Upper Hurricane Creek, Broxton Creek, and the water-access areas. The Nassau River Embayment project is proposed primarily as an experimental development to provide a prototype in fish and wildlife management research for determining the optimum plan for utilizing large areas of undeveloped saline marshes for fish and wildlife.

Recreation

The recreation program will extend basin-wide. Included are the single-purpose features and the multiple-purpose projects at Big Satilla Creek, Axson, Nassau River Embayment, Upper Hurricane Creek, Broxton Creek, and water-access areas. This program includes the expansion of 11 existing recreation areas and the installation of 5 new recreation areas.

The proposed and existing facilities included in the plan would provide for a projected need of 20 million user-days by the year 2000. Development of existing and new facilities would accommodate about 14,550,000 user-days at

TABLE 4.10
Fish and Wildlife Benefits and Costs
(thousands of dollars)

Project or program	Benefits Annual equivalent	Costs		
		Total	Annual equivalent Operation, maintenance, and replacements	Investment
Big Satilla Creek*	135	110	9	2,800
Axson*	141	90	9	2,240
Nassau River Embayment*	780	170	63	2,960
Upper Hurricane Creek*	125	97	8	2,440
Broxton Creek*	7	6	2	100
Water-access areas*	63	61	33	790
Sport fisheries	873	344	306	1,505
Wildlife	465	488	441	1,550
Commercial fisheries	1,090	735	731	215
Total	3,679	2,101	1,602	14,600

*The costs given are those allocated to fish and wildlife.

TABLE 4.11
Recreation Benefits and Costs
(thousands of dollars)

Project or program	Benefits Annual equivalent	Costs		Investment
		Total	Annual equivalent Operation, maintenance, and replacements	
Big Satilla Creek*	840	319	130	5,610
Axson*	273	151	71	2,340
Nassau River Embayment*	60	20	13	180
Upper Hurricane Creek*	210	126	54	1,980
Broxton Creek*	156	69	30	1,090
Water-access areas*	3,936	970	614	9,840
Recreation areas	16,180	3,898	2,204	58,940
Total	21,655	5,553	3,116	79,980

*The costs given are those allocated to recreation.

island beaches and recreation areas. Major impoundments, general outdoor recreation, and cultural areas would accommodate 5,450,000 user-days by the year 2000.

Projects and programs for recreation development during the period 1960-2000 would provide for 17,495,000 user-days—7,695,000 user-days with expanded facilities over those existing in 1960 and 9,800,000 user-days at new areas.

Salinity and Sediment Control

Salinity and sediment are not major problems in the basins. Roadside erosion does occur and some wells along the coast have had salt-water intrusion. The withdrawal of ground water can be controlled so that back flow of ocean water into the aquifer will not be a serious problem. There will be some incidental sediment control values from the agricultural and multiple-purpose programs and projects, but the benefits have not been evaluated separately.

Pollution Abatement and Public Health

The pollution abatement and public health benefits will be largely derived from the direct action of individual municipalities, counties, and industries. The improvements proposed include the expansion of sewage treatment facilities, vector control programs, and solid-waste programs. In addition, the Axson, Upper Hurricane

Creek, and Broxton Creek multiple-purpose reservoirs would furnish water for low streamflow augmentation which would improve the water quality by the dilution of wastes.

Benefits derived from low-flow augmentation for the dilution of wastes are based on the savings in treatment costs that would be required to obtain the desired water quality.

The program for public health consists of drainage and spraying for vector control, sanitary landfill operations for fly and rodent control, and participation in statewide programs for air pollution and radiological monitoring. The public health program is essentially single purpose except for the Nassau Embayment project which by proper operation would reduce the breeding places for mosquitoes and sand flies. The health aspects of other projects and programs relate to the prevention of additional hazards to health and these costs are, therefore, included in the other purpose costs. The public health program is justified on the basis of intangibles. For purposes of cost allocation, the vector control benefits accruing from the Nassau Embayment were assumed equal to the cost of an equivalent vector control program.

These programs will contribute to the general health and welfare of basins residents, tourists, and recreationists, including fishermen and hunters.

TABLE 4.12
Pollution Abatement and Public Health
Benefits and Costs
(thousands of dollars)

Project or program	Benefits Annual equiva- lent	Costs		Investment
		Annual equivalent		
		Total	Operation, main- tenance, and replacements	
Pollution abatement				
Municipal	1	611	149.0	19,895
Industrial	1	62	37.0	1,005
Axson ²	297	27	2.0	690
Upper Hurricane Creek ²	75	31	2.0	820
Broxton Creek ²	200	53	8.0	1,240
Total	1	784	198.0	23,650
Public health				
Solid-waste disposal	1	278	270.0	400
Vector control, basinwide	1	221	221.0	0
Air pollution monitoring	1	10	10.0	0
Nassau River Embayment ³	10	5	0.3	140
Total	1	514	501.3	540

NOTES: ¹ Justification is based largely on intangible benefits.

² The costs given are those allocated to pollution abatement. The benefits given are for dilution water provided by multiple-purpose reservoirs for which monetary benefits are assumed equal to the average cost of tertiary treatment to provide water of similar quantity and quality.

³ The costs given are those allocated to public health for vector control. The benefits given are those considered equal to the cost of the work that would be required to provide mosquito control if the project were not constructed.

Other Beneficial Purposes

There are no specific development features in the plan for purposes other than those listed above. Existing hurricane warning systems should be improved and studies of beach erosion control and hurricane protection should be made. Programs for obtaining topographic and geologic mapping, hydrologic data, data on water quality and water use, and on land-use changes to improve and add to the store of basic data on the area resources are needed.

Future use and regulation of streams will require forecasts of flow, both high and low, as far in advance as is practicable. All river-related

purposes such as recreational boating and fishing, navigation, water supply, pollution abatement, public health, irrigation, and flood control are benefited by advance information as to the expected flows. The costs of forecasting are relatively small and are included in the overall project and program costs. The benefits are also included in the assumption that the best possible forecasts will be available. These benefits are not achieved automatically. A deliberate program which recognizes the necessary lead time for development of reporting network and other facilities is required.

SECTION III – IMPACTS OF THE PLAN

Economic

A major objective of the plan is to improve the environment of the basins for people and

industry. These improvements are not all measurable in tangible terms. Identifiable primary tangible benefits have been used for monetary

evaluation of the projects and programs in this plan. The greater use and greater value, however, might very well stem from benefits not identified or fully recognized in the monetary evaluations. These nonevaluated benefits may be either or both primary and secondary in nature.

The impact of programs and projects which involve increased production of commodities would be felt in the general community by requiring additional production materials and processing equipment, and more services to provide the material, maintain the equipment, and to sustain its operation. These increased activities would stimulate a large exchange of money throughout the basins. Similarly, it is expected that there will be very sizable impacts from recreation and sport fishing and wildlife projects and programs. Fishing camps, motels, sporting goods stores, service stations, boat dealers, restaurants, and related new businesses would be required.

Development of the water and land resources in the Satilla-St. Marys basins might start economic development that would reach beyond the limits of the basins. Such development could affect the entire States of Georgia and Florida as well as the entire Southeast River Basins area. Certain impacts may be felt, also, in a much wider region. Some of the more significant impacts, for each purpose served by the plan of development, are discussed in the following paragraphs.

Flood Control

The Nassau River Embayment project is designed to reduce the flooding of the area around Callahan. Upstream watershed projects throughout the basins will improve the overflow condition in the downstream valleys. Greater protection from floods will result in increased land values and more intensive land use. This will, in turn, make the basins more attractive to widespread expansion of business, agriculture, and manufacturing industry.

Water Supplies

Water availability governs all human activity. Abundant supplies of water often set the stage for rapid economic development. One should

not let the present availability diminish the value of water and its benefits. The availability of good quality water in ample supplies determines to a considerable extent the character and degree of community and industrial development. Availability of water can start or continue an expansion that will result in great economic benefits to any locality. Therefore, in reality, the value of water to an area as a natural resource to be preserved for the future should be considered as much greater than the cost of obtaining it today.

Navigation

Of the three navigation projects proposed in the plan, the two harbor improvements would be of great importance to the industrial and economic growth of the basins, particularly for the cities and vicinities in which the harbors are located. The harbor at Brunswick, Georgia, has an expansion project underway to meet present and immediate future needs. Umbrella Creek is primarily for the navigation of pleasure craft. The project would dredge and restore a once *good navigable channel* and thereby reestablish the value of properties in the area.

Irrigation, Drainage, Flood Prevention, and Soil Conservation and Utilization

The Georgia portion of the Satilla-St. Marys basins has long been dependent on agriculture as a major segment of its economy. In the Florida portion, agriculture has not had that importance. Although it is expected that agriculture will decline as an employment factor, even in the Georgia portion, this facet of the economy will continue as a source of raw materials for food processing industries. The impacts from the potential development are many and will have real and lasting effects on the basins communities. Economic stability will be encouraged by increases in income for processing industries, financial institutions, retail merchants, and others.

Upstream watershed projects, where impoundments are part of the works, will contribute toward an adequate agricultural water supply for the people of the basins. These projects also will accrue pollution abatement and flood prevention benefits and lessen sediment damage. All

of these features have secondary and intangible benefits.

Fewer people than are now working in agriculture are expected to cultivate about 25 percent more acreage by the year 2000 in the Satilla-St. Marys basins. Crop production is expected to increase appreciably over production in 1960. Some crops will more than double in production while others will make substantial gains. Projected net agricultural income is over \$29 million as compared with only \$9 million in 1960.

It has been estimated that for every dollar of net income derived from primary industries, including agriculture and recreation, there is at least an additional \$1.25 to \$1.50 additional income generated in the community. This effect is shown in increased business activity in trades, services, and financial establishments.

By 2000, annual expenditures by farmers in the basins for agricultural production are expected to exceed \$51 million. It is estimated that they should be spending \$13.8 million for feed, \$3 million for livestock purchases, \$1 million for seed, \$5.5 million for fertilizer and lime, \$6 million for repairs and maintenance, \$7 million for labor, \$1.4 million for taxes, \$1 million for interest, and \$12.3 million for other purposes. Supporting retail, wholesale, service, and financial activities will be affected greatly by these expenditures.

Only the portion of the total agricultural program which involves soil conservation and utilization, reclamation, drainage, irrigation, and upstream watershed improvements is included in the basins plan. The benefits, primary and secondary, from these programs will create a portion of the economic impacts of the total agricultural program. They, like the impacts from other aspects of the agricultural program, will have real and lasting effects on the basins communities. Benefits will accrue through improved efficiencies of farm operations; reduction of turbidity of many streams; prolongation of the useful life of surface reservoirs; some alleviation of flood and sediment damage to roads, bridges, roadfills, livestock, and real and personal property; improved wildlife habitat and recreation facilities; and abatement of stream pollution. They also facilitate proper utilization of

agricultural lands by reducing land erosion, permitting more intensive utilization, and contribute toward an adequate agricultural and non-agricultural water supply for the people of the basins.

Hydroelectric Power and Industrial Development

There are no hydroelectric power projects proposed for installation in the basins. Most of the power needs of the area will continue to be served by sources outside the basins. Private power companies will probably construct additional electrical facilities including steam powered electric plants using the assured cooling water supply provided by the proposed reservoirs.

Manufacturing employment projections for the basins show increases in all manufacturing categories by 2000 except textiles. The most notable expansions will be in food processing, pulp and paper, and chemical products. There is also a possibility of even greater increases in chemicals and allied products as a result of missile development work now underway in the basins.

New manufacturing employees and those in supporting industries and trades will buy new homes, cars, furniture, appliances, food, drugs, and services. This means increased demand for streets, water, sewerage, protection, and schools. Communities that keep abreast or even ahead of these demands are the communities that are going to realize the fastest growth.

Capital expenditures for manufacturing expansion expected in the basins will average about \$6.7 million annually. An annual average of 480 new jobs is expected to be created in manufacturing and approximately 1,200 new jobs are expected to be forthcoming annually in services, trades, and professional categories.

The economic impact of industry does not stop when it reaches the city limits or even the basins boundaries. Its effects are far reaching, with the larger trading centers such as Jacksonville, Brunswick, Waycross, and Savannah feeling the greatest results of this activity.

Forest Conservation and Utilization

Forest conservation and management are important in the Satilla-St. Marys basins because of the raw materials needed to advance the

manufacturing potential. The pulp and paper industries, as well as the lumber, naval stores, and wood products industries, hold promise for employment growth. These two industries are dependent on raw materials to assure this growth potential.

Income from forestry practices are of great importance to the smaller rural communities as well as to Brunswick and St. Marys, Georgia, and Fernandina Beach, Florida, where the pulp and paper mills are located. Harvesting, transporting, and processing of the material means increased employment and increased expenditures for equipment, supplies, taxes, and services.

The forestry program will improve the condition of the forest soil, thereby reducing erosion and storm runoff. It will enhance the recreation possibilities in the basins and provide better fish and wildlife habitat. The economic impacts from these factors are discussed elsewhere in this Section.

Fish and Wildlife

The expenditures of sportsmen in the recreation areas, as well as in the towns or cities where they reside, often add much to the basins economy. Additional employment opportunities would be afforded by many small businesses engaged in boat building and supplies, operation of fishing and hunting camps, and in services and sales of food, gasoline, arms and ammunition, fishing tackle, live bait, and other sporting goods and supplies.

Less easy to identify are the benefits derived by general enhancement of the recreational opportunities afforded by a given locality. The growth of many towns and cities in this portion of the Southeast will depend to a great extent on their attractiveness and proximity to lands and waters affording good hunting and fishing.

Table 4.13 summarizes some of the percentages of expenditures which could be expected from hunting and fishing in the basins. These are compiled from national averages but are considered illustrative of the general distribution of anticipated expenditures for hunting and fishing.

The commercial fishing industry generally is plagued by the vagaries of weather, seasonal fluctuation of supply, precarious market condi-

tions, and lack of good conservation practices. As a result, this industry is not attracting energetic young men. The benefits which could be realized, however, are of such magnitude as to justify a vigorous effort toward attracting new men into the industry.

TABLE 4.13
Percentage Distribution of Expenditures
Hunting and Fishing—1960

Expenditure item	Hunting	Fishing
Food	7	8
Lodging	2	2
Transportation	15	14
Equipment	49	48
License, tags, permits	5	2
Leases, fees, other	22	26
Total	100	100

Secondary benefits include increased employment in the fishing and seafood industries and in boat building, boat maintenance, and boat supply enterprises. More services would be required and sales of food, gasoline and oil, fishing supplies, and other equipment would increase.

Recreation

Areas and States compete with one another for the tourist or recreationist dollar. Recreation activities create economic stability in many areas including some of the coastal areas of the Satilla-St. Marys basins and the offshore islands. Several segments of industry such as boat building, recreation equipment, and camping equipment and various trades and services that are wholly dependent upon outdoor recreation pursuits have evidenced phenomenal growth in the Nation in the last decade. As leisure time and per capita income increase, this trend will continue.

Outdoor recreation produces many primary benefits. Some of these benefits are intangible. Recreation provides the healthful exercise necessary for physical fitness. It promotes mental health and offers spiritual values. It is valuable for nature education.

Recreation produces secondary benefits, too. These secondary benefits are reflected in the economy of the area, the community, and the Nation. Some of these secondary benefits are:

- (1) Stimulation of travel and travel expenditures.

(2) Development of business activity in areas within, adjacent to, or enroute to recreation areas, increasing retail trade and new construction.

(3) Stimulation of business activity relative to the manufacture of recreation equipment.

(4) Increased property valuations in and around recreation areas.

(5) Increased miscellaneous net tax revenues after deducting increased governmental expenditures for needed governmental services.

Surveys have been made in many areas, but the effectiveness of these surveys is dependent upon how they were developed and for what purpose. Some of the surveys give individual expenditure estimates running from \$4 to \$7 per day and breakdowns of expenditures for food, lodging, and transportation. A recent Georgia survey determined that approximately \$4 are spent daily by the recreationist. These expenditures are reflected in the economic activities mentioned above. Even if this rate does not increase in the next 40 years, the expected 20 million user-days of recreation in the Satilla-St. Marys basins annually by 2000 would mean expenditures of over \$80 million. This is more than the total annual expenditures in the agricultural production program.

Water-based recreation is of special importance to outdoor recreation. Reservoirs, lakes, coastal areas, and unpolluted streams generate more recreational activity than any other recreation factor. A recent study was made in the Arkansas-White-Red River Basins of selected counties with significant reservoir shorelines in contrast with selected counties in the same vicinity without reservoirs. The 10-year study showed an increase in per capita income of 57 percent in the reservoir counties as compared with only 23 percent in the nonreservoir counties. Bank deposits increased 57 percent in the reservoir counties and only 40 percent in the nonreservoir counties. Tax levies were up 64 percent in the reservoir counties and only 3.8 percent in the nonreservoir counties. Also significant in the reservoir counties was an increase in investment in overnight lodging facilities, annual expenditure on private home construction, and new school construction. Nonreservoir counties showed little increase in these activities.

While all of the economic gains in these reservoir counties cannot be directly attributed to the presence of new lakes, it is evident that the new recreational activities had pronounced effect. The reservoir counties are better off by nearly all economic yardsticks. These counties were comparatively depressed prior to the construction of the reservoirs so that the impact of the recreation dollar was somewhat more dramatic in this situation that it would be in an area of greater activity.

Pollution Abatement and Public Health

Pollution abatement enhances the well-being of people as to their choice of place of residence, employment, and recreation. Thus, this is important in two primary ways: (1) It is necessary for sustaining a healthy environment, and (2) it is helpful in attracting others to the basins.

Pollution abatement is frequently necessary to realize fishing, hunting, and recreational opportunities. In turn, it improves land and property values which have a great impact on economic development. Industries are particularly interested in establishing new plants in areas where pollution problems can be handled effectively.

Data available indicate little pollution in the streams of the Satilla-St. Marys basins. The existing pollution in some of the streams and tidal areas is primarily from municipal and industrial wastes and from decaying material in swamps. The swamps generally serve as barriers against main-stream pollution. To treat properly all of the municipal wastes in the basins will require about \$8.7 million in treatment plants and sewerlines by 1975. Construction of these facilities would provide employment in 16 communities in the basins. Other expenditures of \$11.2 million will be required between 1975 and 2000 to keep abreast of the population growth throughout the basins. In addition, industrial waste-treatment plants will be constructed requiring an investment of over \$1 million during the next 40 years.

It is difficult to assess the impact of a pollution abatement program. There are intangible economic benefits from improved waters as mentioned above. In these particular basins where recreational and industrial developments are so

very important to the future economic development, water quality assumes even greater importance. Pollution abatement now would constitute insurance for future usefulness as well as for immediate purposes.

Public health programs for control of vectors, mainly mosquitoes, sand flies, and deer flies, are also important. The coastal areas of the basins with tidal marshland, as well as the entire length of the basins with swamps, offer breeding places for mosquitoes. Much of this can be eliminated by better drainage. Elimination of these undesirable vectors could well mean the difference in some places between success or failure in the efforts to improve the area economy.

Other Economic Impacts

Besides the impacts of the functional programs, other noteworthy economic impacts relate to several or all of the functional programs.

Land enhancement impacts—Land and water resources improvements have not been planned specifically for enhancement of land. However, the land enhancement benefits that would result from reservoir construction and certain other projects would be considerable. Many public costs are associated with rising land values, so that the entire amount of these values cannot be looked upon as net benefits. Waterfront property, particularly that suitable for homesites and recreational and industrial development, is generally marketable at a higher value than non-waterfront property with all other factors being equal. Land that was previously woodland is subdivided into more expensive lots. Other areas become important for industrial property because of stable, ample, and unpolluted water supplies.

Rapid development of lakeshore property for recreation and commercial use has followed reservoir development throughout the Southeast River Basins area. This development, with resultant increase in property values, has naturally been greater and more rapid in those areas located near major population centers. Reconnaissance studies in the Lake Lanier area suggest that property values in the vicinity of reservoirs used extensively for recreation have increased tenfold during the first 10 to 12 years of development.

This is not to claim that all land enhancement values or projects outlined in the comprehensive plan will be of the same magnitude. Several factors influence land enhancement and are listed as follows:

- (1) Proximity to urban population,
- (2) shoreline topography,
- (3) fluctuation in water level,
- (4) water quality,
- (5) accessibility and shoreline ownership, and
- (6) size of water body.

In the future, as waterfront property becomes more scarce as a result of increases in population and leisure time, the enhancement of land will be an even greater secondary effect of water project development.

Impact from tax revenues—Increased tax revenues usually come as a result of increased economic activity, increased land and resource productivity, more intensive land use, and more real property. Counties that today have a uniform or declining economic activity, low level forest and farm productivity, poor land use, and little new construction are not in a favorable position to realize greater tax revenues. Even tax equalization is difficult under such a situation. Without sufficient tax revenues, government efficiency and extension of community services are almost impossible.

Development of projects and programs envisioned in the comprehensive plan will do much toward alleviating this situation. Increased economic activity will follow as a result of the implementation of the projects and programs. The forestry program will result in increased forest productivity. The soil conservation, reclamation, irrigation, and drainage programs will mean increased farm productivity. Increased economic activity will result in more residential and business construction. All of these effects coupled with judicious tax equalization, mapping, and platting, and governmental administration will mean increased tax revenues and more governmental services.

Inundated reservoir lands and lands taken out of production for other projects and purposes may create a loss in taxable property to the county tax rolls. However, these tax revenue losses do not necessarily have to be permanent.

In the case of reservoir lands through proper development and management of the shoreline area, the land enhancement and new construction resulting would practically always soon outweigh the losses. In the previously mentioned study of selected counties following reservoir construction in an underdeveloped area in the Arkansas-White-Red River Basins, it was found that taxes levied were up 64 percent at the end of 10 years. Nearby counties without reservoirs increased less than 4 percent in tax revenues. This study also pointed out that the 10-year average annual revenues paid to the counties in lieu of taxes far exceeded the first year tax loss from inundated property. In some cases, this average annual revenue amounted to over ten times the first year tax loss. On the whole, the average annual revenue was a gain of over 320 percent above the first year tax loss. This revenue is not included in the 64 percent increase in taxes levied mentioned above.

Impacts from construction activities—The construction of storage works and other facilities would provide an economic stimulus to the local area during the construction period. This is brought about by the temporary influx of workers for the project who desire housing, food, services, and entertainment and by the fuller employment and higher payment to workers from the local labor force. Most of this economic activity, stemming from wages and salaries, is felt locally.

It has been estimated that about 60 percent of the total construction cost is labor cost. Whether or not this would be spent mostly locally would vary with the individual projects and their proximity to urbanized areas. The remaining 40 percent is for materials, equipment, maintenance, and service, and most of these costs would affect a larger area—even the national economy—and are less impressive to any individual locality. It should be remembered that the community is subject to substantial cost as a result of increased population engaged in construction, and this cost must be considered in appraising the benefits.

Impacts from migration—A high birth rate, a relatively dense population for an agricultural area, and limited employment opportunities have produced in the Southeast River Basins an

extremely mobile population. Out-migration and regional urbanization have been good, in many respects, as safety valves which have prevented population pressures from reaching even more undesirable proportions in the rural areas. However, migration since the 1930's has also brought about a loss to the area, because these out-migrants represent lost manpower and lost expenditures to the area for the rearing, educating, and training of the migrants.

At the same time, the Southeast River Basins area has evidenced a growing amount of in-migration. Generally, the amount of education, training, and income represented on a per capita basis by this group has been relatively higher than that for the out-migrants. As a result, the economic losses from out-migration have been tempered a little by the economic gains from in-migration.

A migration study was prepared for the Southeast River Basins area as a whole. The results of that study did not provide basins data to show the economic effect of migration on the Satilla-St. Marys basins. However, the trends indicated by the study are assumed to be applicable to the basins.

The study shows that during the period of 1960-75 out-migrants should continue to outnumber in-migrants but not to the extent which was evident from 1930-60. Because the in-migrants are expected to be better educated and skilled than the out-migrants, the area should evidence a modest gain when comparisons are made of the cost of rearing, training, and educating the migrants. During the period of 1975-2000, this economic gain should be even greater because the in-migrants should then begin to outnumber the out-migrants.

Another comparison was made of the personal income of the migrants and anticipated migrants. Under this comparison, the period of 1960-75 should show an economic loss but certainly not nearly as great as that evident during the 1930-60 period. However, during the period of 1975-2000, the area should start to gain economically in this comparison of personal income.

Impacts to redevelopment areas—Of the 17 counties falling wholly or partially in the Satilla-St. Marys basins, 2 have been designated redevelopment areas as of April 20, 1962, under

Section 5(b) of the Area Redevelopment Act of 1961. These were so designated because of persistent and substantial unemployment and other economic problems.

Some of the projects and programs proposed for the basins should help remedy these conditions. For instance, the food and fiber program will improve farm and forest production and income throughout the basins, increasing per capita income, especially for farm families. The commercial fisheries program will increase fish production and assist in increasing employment in the coastal counties. The projects to provide more and better recreational areas will increase per capita income, as well as provide additional employment in the vicinity of the individual projects. Many of the projects will create sizeable temporary employment during the actual construction phase.

In addition, assistance is available to these two counties under the provisions of the Area Redevelopment Act. This assistance is in the form of loans for industrial and commercial projects, loans and grants for public facilities, technical assistance, occupational training, and retraining subsistence payments.

Physical

In general, the land and water resources of the basins are adequate both in quantity and quality to meet all demands for use and development by the year 2000. Land and water need not be limiting factors in the attainment of high economic levels of development by the basins residents.

The planned program will not change the stream regime appreciably, except for improvement downstream from the storage structures. This improvement will consist of evening out the flow, by the storage of floodwater, and the augmentation of low flows. Very little consumptive use of surface water is planned; average streamflows will be within 1 percent of what they have been, with a possible slight gain because of ground water diversion exceeding consumptive use.

The Big Satilla Creek, Axson, Upper Hurricane Creek, and Broxton Creek reservoirs will

provide minimum flows below the damsites of approximately 80, 140, 50, and 11 cubic feet per second, respectively, except during the very dry years. This flow is in contrast with estimated median annual low flows of about 5, 8, 2, and 2 cubic feet per second at the Big Satilla Creek, Axson, Upper Hurricane Creek, and Broxton Creek reservoir sites, respectively. Tidal flows extend up the Nassau River beyond the damsites of the Nassau River Embayment. This project generally will have little effect on the downstream flow of the stream below the dam.

Effects of drainage, land management, and even urbanization will be evident in some localities, but in the aggregate will tend to compensate, and over most of the basins will have little effect on streamflow. Ground water aquifers extend far beyond the basins boundaries, and the small projected withdrawals, if spread over a large area, will have negligible effect on ground water availability.

Water quality will remain relatively unchanged, except for improvement in the localities where there is now pollution. Projected ground water withdrawals are dispersed so that no saline intrusion of aquifers along the coast is expected.

Ground water and surface water are intimately related in these basins. Regulation or withdrawal of one will affect the other. However, the total management of water will involve such a small fraction of the available natural quantities that the balance between ground water and surface water will not be disturbed.

Generally, the needs for all functions in the basins are compatible. There will be increasing competition for land and water in the future, but these resources are not expected to be limiting factors. Implementation of the proposed plan of development will provide the facilities required to permit efficient use of the available resources within the framework of projected requirements. There will still be some flooding, some pollution problems, some legal and institutional difficulties, but the plan, if carried out, will enhance the basins economy. However, such developments will occur only if the proposed plan or one producing similar results is pursued with vigor and completed on a schedule geared to the needs of the area.

SECTION IV – PLAN IMPLEMENTATION

Cost Sharing

The division of cost between Federal and non-Federal entities is emphasized. Resource development costs should be shared so as to serve best the public interest by: (1) Encouraging sound resource development and economic and social stability and growth; (2) promoting maximum efficiency in use of private and public funds; (3) obtaining an equitable relationship between the incidence of costs and benefits; (4) preventing unnecessary waste, unwarranted windfall gains, and undesirable destructive competition; (5) encouraging desirable types and sizes of enterprises; (6) securing consistency between the various purposes of resource development; and (7) promoting public understanding and cooperation in resource development.

Two types of costs are shown for cost-sharing analyses: (1) Investment costs, which include all of the costs of project construction including lands and rights-of-way, estimated for the period of full development of the project; and (2) operation, maintenance, and replacements costs, shown as an annual cost, and estimated on the basis of full development. All costs shown are for the full program to the year 2000.

Operation, maintenance, and replacements costs for use in cost-sharing determinations are based on full use of the facilities that are specifically proposed. Since the ultimate need during the period studied will not normally develop until the year 2000, the full operation, maintenance, and replacements costs for the facilities included in the plan are shown as "OM&R at year 2000." The comprehensive plan is designed to meet needs to the year 2000, so additional needs, costs, and benefits that may develop after that year have not been evaluated. This does not ignore or preclude the possibility of adding facilities after the year 2000 to the then existing projects and programs to meet additional needs.

The cost-sharing figures are only illustrative and are subject to change as more detailed studies are made.

Under suggested cost-sharing policies of the total investment costs, about 35 percent should

be borne by the Federal Government and about 65 percent by the non-Federal interests. For operation, maintenance, and replacements costs, approximately 15 percent should become the responsibility of the Federal Government and 85 percent the responsibility of the non-Federal groups involved in land and water developments.

The cost of recreation is the largest item in the Satilla-St. Marys basins plan, accounting for about 35 percent of the total investment costs. About \$80 million in investment costs and an annual operation, maintenance, and replacements costs of about \$4.4 million will be required for full development of the Satilla-St. Marys recreation plan. Under suggested cost-sharing policies, the investment cost of the recreational program would be divided approximately 41 percent to Federal and 59 percent to non-Federal interests, and the Federal Government would bear about 30 percent of the operation, maintenance, and replacements costs. Big Satilla Creek reservoir has been designated as a project which demonstrates to local interests the economic impacts that would accrue to the areas by such construction. It would be of regional significance. The development of Cumberland Island is of national significance because it is one of the last remaining undeveloped islands in the United States on the Atlantic coast with large potential opportunities for recreational development. The Big Satilla Creek reservoir and Cumberland Island will provide recreation to large numbers of people from other parts of the Southeast and the Nation.

Programs relating to agriculture are the second largest items of cost in the Satilla-St. Marys plan, totaling about \$76 million for investment cost with annual cost for operation, maintenance, and replacements of about \$2.5 million. By far the largest of the agricultural programs is that for forest conservation and utilization, where the investment cost is nearly \$47 million. The reclamation, irrigation, and drainage program for the Satilla-St. Marys basins will probably require an investment cost of approximately \$14 million. The cost of the forestry program is estimated to be about 35 percent Federal and 65 percent non-Federal for investment cost,

and 30 percent Federal and 70 percent non-Federal for operation, maintenance, and replacements. As there is a considerable amount of forest land in Federal ownership in these basins, the Federal share of operation and maintenance cost for forest conservation will be greater than average. The reclamation, irrigation, and drainage program is estimated to be about 25 percent Federal and 75 percent non-Federal for the investment cost and the cost for operation, maintenance, and replacements is estimated to be borne almost entirely by non-Federal interests.

The pollution abatement and public health

problems in the Satilla-St. Marys basins will require about \$24 million in investment cost to carry out the plan to the year 2000. It is proposed that the Federal Government share 31 percent of the investment cost for pollution abatement.

The Nassau River Embayment project would be for experimental work for fish and wildlife. The portion of the cost allocated to fish and wildlife, therefore, is considered to warrant a substantial Federal participation because of the research aspects. Accordingly, it is assumed that 75 percent of the investment cost, or \$2,220,000 and 20 percent of the annual operation and maintenance costs, or \$12,700, would be proper

TABLE 4.14
Cost Sharing—Comprehensive Plan

Purpose or project ¹	Investment costs					Annual operation, maintenance, and replacements costs at year 2000				
	Total (\$1,000)	Federal (\$1,000)	(pct.)	Non-Federal (\$1,000)	(pct.)	Total (\$1,000)	Federal (\$1,000)	(pct.)	Non-Federal (\$1,000)	(pct.)
Purpose										
Flood control.....	6,880	3,780	55	3,100	45	79	--	--	79	100
Water supplies.....	22,500	--	--	22,500	100	4,634	--	--	4,634	100
Navigation ²	10,890	7,840	72	3,050	28	711	156	22	555	78
Irrigation ³	4,860	1,260	26	3,600	74	874	7	--	874	100
Drainage.....	8,776	2,190	25	6,586	75	117	--	--	117	100
Soil conservation.....	8,715	2,615	30	6,100	70	357	--	--	357	100
Forest conservation.....	46,650	16,330	35	30,320	65	1,086	326	30	760	70
Wildlife and sport fisheries ⁴	14,385	4,830	34	9,555	66	1,156	22	2	1,134	98
Commercial fisheries.....	215	130	60	85	40	1,254	752	60	502	40
Recreation.....	79,980	32,650	41	47,330	59	4,422	1,308	30	3,114	70
Pollution abatement.....	23,650	7,330	31	16,320	69	332	--	--	332	100
Public health ⁵	540	70	13	470	87	667	--	--	667	100
Project										
Big Satilla Creek ^{3, 6}	8,440	3,800	45	4,640	55	175	35	20	140	80
Axon ³	5,290	630	12	4,660	88	94	2	2	92	98
Nassau River Embayment ⁴	3,900	2,650	68	1,250	32	86	15	17	71	83
Upper Hurricane Creek ³	5,270	738	14	4,532	86	66	2	3	64	97
Broxton Creek.....	2,430	510	21	1,920	79	41	7	1	41	99
Water-access areas.....	10,630	4,252	40	6,378	60	647	97	15	550	85
Upstream watersheds.....	14,780	5,573	38	9,207	62	167	--	--	167	100
Brunswick Harbor ²	8,910	7,070	79	1,840	21	474	141	30	333	70
Fernandina Beach Harbor ²	1,830	730	40	1,100	60	236	14	6	222	94
Umbrella Creek Channel.....	150	75	50	75	50	0.6	0.2	33	0.4	67

NOTES: ¹ Costs for purposes and projects are not additive. Costs of projects are included as part of the costs by purpose.

² Navigation costs in harbor improvement projects are cost shared on the basis of the type of work involved.

³ For purposes of this study, costs of irrigation in reservoir projects are included as Federal costs. Sharing of costs by the irrigation beneficiaries should be made on a case-by-case basis when project is constructed.

⁴ Nassau River Embayment is recommended for research purposes largely in fish and wildlife management.

⁵ The vector control program is a demonstration in vector control at Nassau River Embayment.

⁶ Big Satilla Creek reservoir is recommended as a demonstration in the field of recreation.

⁷ Less than \$500.

as the Federal portion. The remaining amounts, \$740,000 for investment and \$50,600 for annual operation and maintenance, would be a responsibility of non-Federal interests. The costs allocated to recreation would be shared, considering the effects to be of regional significance; that is, the Federal share is estimated at 25 percent of the investment and 15 percent of the operation, maintenance, and replacements. This amounts to \$45,000 investment and about \$2,000 for annual operation, maintenance, and replacements as Federal. *The remaining amounts of \$135,000 for investment and \$11,200 for annual operation, maintenance, and replacements are estimated to be the non-Federal share.* Flood control costs are expected to be shared equally for the investment costs and it is suggested that non-Federal interests bear all the operation, maintenance, and replacements costs, based on a project having local protection effects. This amounts to \$310,000 each for the investment cost and \$9,000 for operation, maintenance, and replacements costs as the non-Federal share. *The costs allocated to vector control are estimated to be shared equally between Federal and non-Federal interests for investment costs.* Non-Federal interests are expected to bear the costs for operation and maintenance amounting to \$300 annually. Each share would amount to \$70,000 for investment.

In view of the uncertainty of definitely establishing the causes of shoaling in the Umbrella Creek channel, it is believed that the Federal Government and local interests should each share equally in the costs of the work. The costs of operation, maintenance, and replacements for this project are estimated to be borne about one-third Federal and two thirds local.

Financing

In 1960, Federal, State, county, local, and private expenditures for resource development in the Satilla-St. Marys basins totaled about \$9.3 million. This was equivalent to about 4 percent of the basins total personal income of \$228 million. An estimated 15 percent of this expenditure is for training, technical aid, and other items not included in the comprehensive plan. This leaves the equivalent of 3.4 percent

of the personal income available to be applied to types of endeavor similar to those in the plan.

The projects and programs covered by this Report involve some private expenditures and some items of public expenditure which have been made since January 1, 1960, the starting date used for the evaluation. The annual personal income in the basins is expected to be about \$386 million by the year 1975, and about \$1 billion by the year 2000. If the current proportion of personal income is continued to be *invested in resource development to the year 2000*, funds would be more than adequate to accomplish the plan.

The annual rate of expenditure needed to accomplish the developments of the plan, in total and in relation to personal income, is higher than the previous or current rate during the first 10 to 15 years and diminishes during the last 25 years. This is due to: (1) An immediate demand for facilities not now developed and (2) the omission of some developments which undoubtedly will be needed in the latter portion of the period 1975-2000, but which were not planned for because the long-range projection of economic conditions used in establishing resources needs was not carried beyond the year 2000.

During the first 10 to 15 years of plan implementation, there will be, therefore, need for additional financing at a rate higher than that prevailing in and prior to 1960 in order to provide for an adequate level of improvements consistent with the needs and opportunities within the basins expected to prevail during the next 40 years.

As an example, studies indicate that the Commission plan to expedite developments now in demand involves capital outlay and operation, maintenance, and replacements costs during the period 1960-75, which would exceed the normal increase of these expenditures at all levels of private and governmental activity, by raising the annual expenditures about \$4 or \$5 million above the amounts which would normally be available for work in these basins. The exact amount would depend upon the promptness in implementing the early action phase of the plan.

The Federal expenditure rate in the Satilla-St. Marys basins is expected to be increased, thus

providing part of the needed funds. The remaining funds for this acceleration period will have to come from non-Federal sources such as State and local governments, and private individuals and enterprises. In the case of State and local governments, the additional funds should come from bond issue, development funds, authority financing, etc., in order to avoid overstressing the current tax base and to enable funds in the hands of private individuals and enterprises to be currently available for the private components of the plan.

Responsibility

The responsibility for initiating the plan basically rests with the State and local interests. Even in those fields where a Federal agency is normally the organization which actually performs the detailed planning and construction, the impetus for the planning study must originate with those whom the programs and facilities will benefit.

The comprehensive plan for the Satilla-St. Marys basins is a combination of projects and programs formulated to meet the needs of the people for land and water resource development.

In most cases, the Commission studies have not been carried beyond the reconnaissance level and thus additional detailed planning is required prior to implementation of the plan. The authorizing Act specifically provides that the Commission plans shall not include final project designs and estimates.

The proposed assignment of responsibility for initiating the developments is made in the knowledge that timely and active interest on the part of the State and local leadership is required.

The designations included in Table 4.15 are made in accordance with the following criteria:

(1) If an existing project or program is to be expanded by the addition of facilities, or acceleration of activity, then the assignment of major responsibility for planning, construction and/or development, and operation is to the agency already having jurisdiction over the existing project or program. For example, if additional facilities are to be provided at a project which is already a Federal project under the administra-

tive supervision of the Corps of Engineers, then this agency would be given major responsibility for planning and construction even though this work might be actually done by other Federal or non-Federal entities.

(2) Where additional facilities are proposed at a project already under non-Federal jurisdiction, then the non-Federal interest is assigned the major responsibility.

(3) Non-Federal programs such as forestry, soil conservation, recreation, fish and wildlife, reclamation, drainage, irrigation, public health, and pollution abatement would continue under non-Federal sponsorship except where such programs apply to national forests, military reservations, and other Federal holdings. Where a clear-cut conclusion is not readily apparent, then selection is to be made on a case-by-case basis, giving due weight to the pertinent circumstances.

(4) New projects or programs are assigned to Federal agencies for planning, construction, and operation where there is a substantial involvement of navigation since this is the general historical pattern. Exceptions are made in the case of navigation improvements where the major portion of benefits are other than commercial navigation.

(5) Historical patterns are also observed in the case of flood control. If the project involves the provision of local protection works on the main stream, then the Federal interests would be responsible for construction and non-Federal interests would be responsible for operation and maintenance. In the case of flood plain management and small reservoir developments located in headwater areas to serve flood control purposes, planning, construction, and operation are designated as non-Federal, although local groups may call upon Federal agencies for assistance in planning.

(6) In the application of the criteria, the incidence of benefits is considered in determining appropriate responsibility. Where benefits are of national significance, Federal responsibility is indicated; where they are local, non-Federal responsibility is indicated. Where these benefits are of regional significance, the matter is decided on a case-by-case basis, considering all of the related circumstances.

(7) In the designation of non-Federal and Federal interest for the major responsibility, there is no intention that such selection would ignore the other interests that may be concerned in planning the details of the proposed program or project. This applies also to construction and operation.

The designation of Federal agencies to have major responsibility for projects and programs generally is made on the basis of the agency usually associated with the purpose having the largest portion of the total allocated costs.

Where projects and facilities have been historically constructed by Federal agencies and turned over to local groups for operation and maintenance, it is intended that this practice be continued.

The non-Federal or Federal interests with the major responsibility for accomplishment, including coordinating the preauthorization planning, obtaining final approval or authorization of specific works or facilities, budgeting for appropriations or other funding, design of structures, administration of construction or installation, and other matters pertinent to planning and

construction are indicated in Table 4.15. The designation of Federal or non-Federal is not intended to prejudice joint non-Federal and Federal development.

Designation of a Federal agency having the major responsibility for the Federal aspects of each project, regardless of the magnitude of these Federal aspects is not intended to reflect any lack of interest by other Federal agencies in a project; in fact, most of the Federal land and water agencies have some interest in each of the projects.

In the general programs and projects, other than those specifically mentioned in Table 4.15, the division between non-Federal and Federal principal responsibility is made on the basis of ownership of the land or area involved. For example, wildlife or soil conservation programs on non-Federal lands are the principal responsibility of non-Federal entities; forestry programs on a military reservation or national forest are a principal Federal responsibility; and recreation programs on a Federal multiple-purpose reservoir project, which envisions Federal acquisition of the general reservoir area, are a principal Federal responsibility.

TABLE 4.15
Responsibility for Implementing Projects

Major responsibility for implementing designated projects	Project	Early action phase ¹	Purpose ¹	Federal agency with major responsibility for Federal aspects
Non-Federal —	Big Satilla Creek	E	F&W, R, I	Bureau of Outdoor Recreation, National Park Service ²
Non-Federal —	Axson	E	F&W, R, PA, I	Bureau of Outdoor Recreation, National Park Service ²
— Federal	Nassau River Embayment	E	F&W, R, FC, PH	Bureau of Sport Fisheries and Wildlife
Non-Federal —	Upper Hurricane Creek	—	F&W, R, PA, I	Bureau of Outdoor Recreation, National Park Service ²
Non-Federal —	Broxton Creek	—	PA, F&W, R	Public Health Service
Non-Federal —	Umbrella Creek Channel	E	N	Corps of Engineers
— Federal	Brunswick Harbor	—	N	Corps of Engineers
— Federal	Fernandina Beach Harbor	—	N	Corps of Engineers

NOTES: ¹ E — Early action phase development
FC — Flood control
N — Navigation
I — Irrigation
F&W — Fish and wildlife
R — Recreation
PA — Pollution abatement
PH — Public health

² Designated agency depends on the established division of responsibility between the Bureau of Outdoor Recreation and National Park Service.

Early Action Phase

While action to achieve the comprehensive plan must be continued for the entire period covered in order to meet immediate requirements for developing the basins resources in an orderly manner and to help stimulate growth in the basins economic structure, certain projects and programs contained in the comprehensive plan for the basins should be initiated as quickly as detailed plans can be prepared for them and necessary financing and other arrangements can be made. Measures should be taken soon to prevent the preemption of sites needed for development from 1975 to 2000.

Basinwide programs for conserving, developing, and utilizing land and water resources have been in operation for some time. Their continuation, expansion, and improvement form an important part of the comprehensive plan.

Action for implementing these programs, would continue for the life of the plan and would generally increase gradually in proportion to population and economic growth. However, there are certain components of the program on which action should be started early. Included in this category are improvement works having a long timelag between initial action and full utilization, activities for conserving and protecting resources for future use, and items that require special emphasis or action to bring them in balance with general development.

The following projects and programs should be initiated at an early date for the reasons listed.

Multiple-Purpose Dam and Reservoir Projects

Early action should be initiated on Big Satilla Creek, Axson, and Nassau River Embayment projects. Big Satilla Creek project would demonstrate to local interests the desirability of constructing similar projects primarily for recreation but it would also be used for fishing, and irrigation. A large storage capacity is planned for the Axson reservoir for augmenting the low flows of the Satilla River for fish propagation and pollution abatement. This improvement of the river is needed now. The Nassau River Embayment project would be primarily for experimental purposes for utilizing large areas of saline

marshes for fish and wildlife use, and the need for early action in planning and construction of the project would be very desirable so that the results could be utilized for possible similar projects in other areas of the Southeast where this type of development is needed. The three projects would provide annually by 1975, 360,000 user-days of recreation and 518,000 user-days of fishing. The recreation and fishing facilities needed could be expanded as the need arises.

Water Access Areas

Twenty of the proposed 30 access areas for recreation and fishing and wildlife use and 5 access areas for fishing and limited hunting should be constructed at an early date.

Flood Control

Most of the flood control damages in the basins occur in the upstream tributaries. To reduce these damages, early action should be initiated on upstream watershed projects. The completion of these projects would permit better utilization of land now flooded resulting in increased crop and pasture production. Early completion of the Nassau River Embayment project would reduce damage from the flooding of Mills Creek, a tributary of the Nassau River.

Water Supplies

The water supplies program should be initiated immediately. In the larger metropolitan areas, it is necessary to plan and make provisions for supplying water far in advance of the actual needs. This is particularly pertinent for Brunswick and other coastal areas where salt water may intrude into the water supplies unless long-range plans for meeting the needs are prepared.

Navigation

The shoals in the channel of Umbrella Creek should be dredged and works to direct flows through the channel for its maintenance should be provided in the near future. Otherwise, this channel may soon be useless for the navigation of small craft. Loss of the navigation channel would result in decreased property values in the area.

Reclamation, Irrigation, and Drainage

Early action should be initiated on irrigation and drainage to stimulate the economy in the basins. Irrigation and drainage would be used primarily to increase the efficiency of production of the high-value crops such as tobacco and vegetables. In view of the limited needs of these high-value crops and the current limitations imposed by ownership patterns and land use and institutional factors such as crop allotments, the projected acreage included in the plan is considered a reasonable figure. Drainage, by channel improvements, would provide both drainage and flood control benefits and thereby stimulate the agricultural economy.

Soil Conservation and Utilization

While the utilization of soil resources will be largely controlled by current requirements, reasonable effort should be made early to apply conservation practices, particularly those measures which will prevent permanent losses of our soil resources. Needed permanent conservation measures should be installed in the early action phase.

Forest Conservation and Utilization

To protect and conserve forests for future use, the fire, insect, and disease control program should be emphasized for early action. The balance of the program should be initiated early and be continued to facilitate the present and future forestry program. The forestry program covers one of the more important resources in the Satilla-St. Marys basins. It will continue to be important into the foreseeable future.

Fish and Wildlife

The wildlife and sport fisheries programs should be initiated early as they would exert an influence throughout the basins. In addition to the multiple-purpose reservoirs projects and access areas which have been described, the improvement of existing wildlife management areas and streams and the establishment of new management areas and new fishing programs are needed to preserve and utilize the fish and wildlife resources.

Immediate and increased emphasis should be

given to the restoration of the oyster fishery and the cultivation under controlled conditions of shrimp, oysters, pompano, and other high quality fishes.

Recreation

In addition to the multiple-purpose projects which would include facilities for recreation, 16 projects are included in the plan for recreation alone. This recreation program includes the expansion, at an early date, of the 11 existing recreation areas and the acquisition of land and initial development of new areas. The development and expansion of these areas would be continued during the period from 1975 to 2000.

Pollution Abatement and Public Health

Immediate action should be taken to develop a long-range plan adequate to handle the liquid wastes from the growing urban areas. Such wastes must ultimately be discharged into the water courses and the volume will increase in direct proportion to the population growth and urban development. Unless long-range plans are implemented appropriately, water resources will be damaged and beneficial uses impaired.

Further improvement of the water quality of the Satilla River and several of its tributaries should be attained by providing storage in the proposed reservoirs for low streamflow augmen-

TABLE 4.16
Summary of Early Action Investment Costs
(thousands of dollars)

Project or program	Investment to 1975
Big Satilla Creek	7,394
Axson	5,015
Nassau River Embayment	3,900
Water-access areas	6,407
Upstream watersheds	13,000
Water supplies	11,840
Umbrella Creek Channel	150
Reclamation, irrigation, and drainage*	1,838
Soil conservation	3,312
Forest conservation	22,570
Fish and wildlife*	2,454
Recreation*	31,920
Pollution abatement and public health*	9,710

*Data presented are exclusive of investments associated with multiple-purpose projects.

tation. The Axson reservoir, proposed for the early action phase, would furnish water for dilution of wastes in the Satilla River.

Early action should be taken to implement plans for vector control, solid-waste disposal, and air pollution and radiation monitoring. Implementation of such programs would help sustain and improve the health of the people in

the basins and make a more desirable climate for industrial and recreational pursuits.

The investment cost of the early action phase is about one-half that of the total investment cost of the projects and programs in the comprehensive plan. An analyses of the investment costs by projects and programs in the early action phase are shown in Table 4.16.

SECTION V – PROJECTS AND PROGRAMS

The comprehensive plan for the Satilla-St. Marys basins includes both specific projects, usually multiple purpose in concept, and general programs, usually single purpose in concept but which often involve compatible multiple uses. The developments, both specific projects and general programs in combination, are necessary to meet the growing resources development needs. Resource developments either existing or under construction as of 1960 are a necessary part of the plan, however, only the proposals for new developments and for expansion of existing developments to be made during the period 1960-2000 are presented in this Section.

In order to bring the data for multiple-purpose developments together and to provide analysis of costs and benefits by States, each project and single-purpose development is summarized in the pages that follow. Data for entire projects and single-purpose developments are provided and investment costs to be incurred in the early action phase are also shown.

Project design, quantity estimates, and areas required were taken from earlier reports, or were based on observations made on reconnaissance field surveys, topographic maps that have contour intervals of 10 to 50 feet, and available hydrographic data. Instrumental surveys for this study were limited to one cross section taken at the damsite for each of the proposed water storage projects where previous surveys had not been made.

In addition to the impacts discussion for each project and program in this Section, more general economic impacts stemming from the comprehensive plan are discussed in Section III, Part Four, Impacts of the Plan.

All elevations shown are related to mean sea level. Spillway discharges shown were estimated for a reservoir water surface at maximum pool elevation. Minimum flows provided in streams below dams are those that can be made available at least 90 percent of the time during any 10 consecutive years.

BIG SATILLA CREEK PROJECT

Location

Big Satilla Creek damsite is on Big Satilla Creek, a tributary of the Satilla River, about 17 miles southeast of Baxley, Georgia. The reservoir site is in Appling and Bacon Counties, Georgia. The damsite is about 2 miles downstream of the confluence of Sweetwater Creek and Big Satilla Creek.

Plan

The proposed project consists of a dam and reservoir, two parks, and water-access areas. The

primary purpose of this project is recreation, but it would also provide benefits to fishing and irrigation. Storage in the reservoir would be provided for low streamflow augmentation for fishing and irrigation.

The dam would be an earthfill structure with a concrete ogee spillway section and apron and a steel sheet cutoff wall located at the upstream end of the spillway section. The reservoir would extend above the dam about 11 miles up Big Satilla Creek and about 8 miles up Sweetwater Creek. Land to be acquired for the dam and reservoir to the spillway design pool elevation

BIG SATILLA CREEK PROJECT

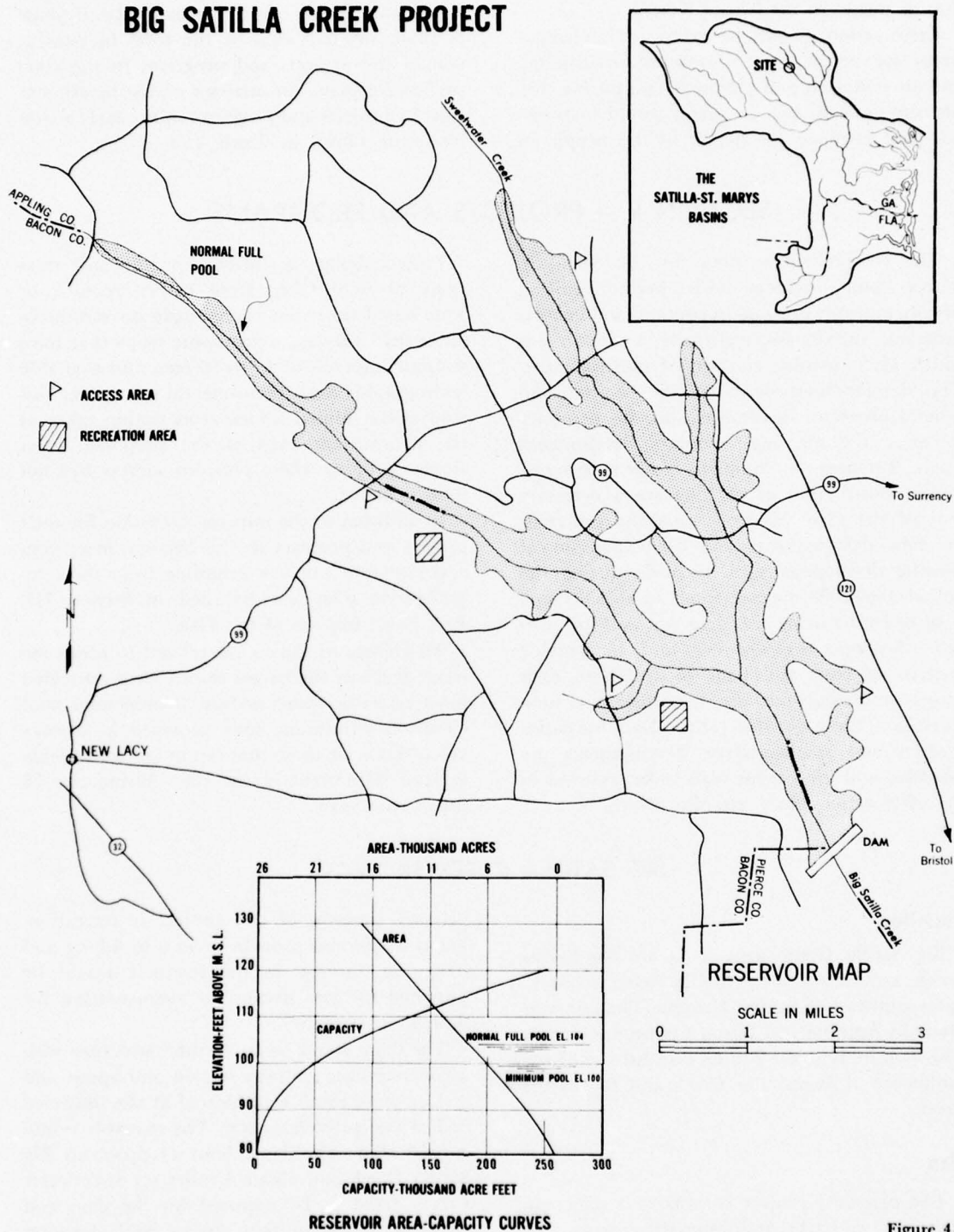


Figure 4.2

is estimated to be 10,400 acres. In addition, about 3,100 acres would be needed for parks, access areas, and other public use. The principal relocations would be a few miles of secondary roads, power and telephone lines, and a small cemetery. Two 1,500-acre parks, adjacent to the reservoir, with facilities for boating, water skiing, swimming, camping, picnicking, and sightseeing would be provided for recreation. The facilities would initially handle, annually, an estimated 200,000 user-days of recreation. The maximum development would be for 500,000 user-days annually. Access areas for fishermen would be provided adjacent to the reservoir and in the recreation areas. The reservoir would meet the needs for an additional 80,300 user-days of fishing by 1975 and 84,300 by the year 2000. Storage of water for the irrigation of about 500 acres of land by the year 2000 would be provided in the reservoir. The reservoir would be operated to maintain a minimum flow of 80 cubic feet per second below the dam and to fluctuate the pool level so as to minimize mosquito and other vector problems.

Data

	Unit	Amount
Drainage area	sq. mile	252
Dam		
Length	ft.	5,500
Maximum height	ft.	50
Spillway		
Effective length	ft.	670
Crest elevation	ft.	104
Design discharge at elevation 112 ft.	c.f.s.	60,500
Reservoir elevations		
Normal full pool	ft.	104
Minimum design pool	ft.	100
Maximum design pool	ft.	112
Reservoir areas		
Normal full pool	acre	7,500
Minimum design pool	acre	6,000
Maximum design pool	acre	10,400
Reservoir capacities		
Normal full pool	acre-ft.	81,000
Minimum design pool	acre-ft.	51,000
Maximum design pool	acre-ft.	150,000
Runoff volume, normal full pool	inch	6.0

	Unit	Amount
Storage requirements		
For irrigation	acre-ft.	500
For streamflow regulation and evaporation losses, etc.	acre-ft.	29,500
Design minimum flow required in stream below dam	c.f.s.	80

Benefits

Annual Equivalent Primary Tangible (\$1,000)

Recreation	840
Fish and wildlife	135
Irrigation	3
Total	978

Impacts

The economic impacts from this project stem largely from the proposed purposes of recreation and fishing. There would be increased business activity in the immediate area and increased sales of such items as gasoline, fishing and recreation equipment, food, beverages, and lodging.

Although land enhancement benefits were not considered in evaluation of this project, there will be significant impacts from this source. These impacts will be significant from this project although it is not anticipated that they will be as great as the example of Lake Lanier cited in Section III, Impacts of the Plan, since the nearby population will be considerably less and the reservoir will be smaller. The construction of homes around the reservoir would be an asset to the area as would the increased tax revenues from this source. Legislation setting up a local development agency to construct the project should provide for the capture of some of these enhanced values and additional tax revenues to assist in paying for the project. This is being done in one 300-square mile area in West Tennessee.

The construction of the dam and reservoir would provide temporary employment in the immediate area in the construction trades.

The irrigation storage provided in the reservoir would be used by landowners and operators and would be of benefit to the area. The impacts from this would be measured in greater agricultural production due to assured water supply.

Costs (\$1,000)

Investment	Early action	Total
Dam and reservoir	5,725	5,725
Recreation facilities	1,569	2,615
Fish and wildlife facilities	100	100
Total	7,394	8,440

Annual Equivalent

Investment	290.9
Operation, maintenance, and replacements	139.1
Total	430.0

Allocation of Costs (\$1,000)

	Investment	Annual equivalent Total	OM&R at OM&R year 2000	
Recreation	5,610	319	129.9	165.8
Fish and wildlife	2,800	110	9.1	9.1
Irrigation	30	1	0.1	0.1
Total	8,440	430	139.1	175.0

Special Considerations

The Big Satilla Creek reservoir would be very desirable for recreational activities. The size and

depth of the reservoir and the configuration and slope of the shorelines would be such that many types of water sports could be pursued at the same time. During most of the year, the reservoir pool would be relatively stable. The difference between the normal pool elevation and the minimum design pool is estimated to be about 4 feet. The quality of the water would be excellent for water-contact sports. The project location is about 30 miles from the cities of Jesup, Baxley, and Waycross, and it would be accessible by good highways. It is projected that the project would attract many recreationists and fishermen from the nearby cities and the surrounding area.

Federal financial assistance is recommended to assist in the early initiation of the Big Satilla Creek project. The early development of the project would demonstrate the financial feasibility of this and similar undertakings from the local viewpoint. The revenue from the increases in property values and tax base and the income from the users of the facilities, both in the area and attracted from outside the area, would more than offset the cost of construction and the cost of operation of the project.

AXSON PROJECT

Location

The Axson dam and reservoir site is on the Satilla River in Atkinson County, Georgia. The damsite is located about 3 miles northeast of Axson and 9 miles east of Pearson, Georgia.

Plan

The proposed project consists of a dam and reservoir, two parks, and water-access areas. It would provide benefits for recreation, fishing, pollution abatement, and irrigation. Storage in the reservoir would be provided for low stream-flow augmentation for fish, irrigation, and pollution abatement.

The dam would be an earthfill structure with a concrete ogee spillway section and apron and a steel sheet piling cutoff wall located at the upstream end of the spillway section. The reservoir would extend from the dam up the Satilla River for about 9 miles. Land to be acquired for the dam and reservoir to the spillway design pool

elevation is estimated as 9,200 acres. In addition, about 3,100 acres would be needed for parks, access, and other public use. The principal relocations would be a few miles of gravel surfaced road, powerlines, telephone lines, and a small cemetery. Recreation facilities to be provided at two 1,500-acre parks adjacent to the reservoir would be for boating, water skiing, swimming, camping, picnicking, fishing, and sightseeing.

The recreation facilities would meet needs initially for 100,000 user-days and the maximum development would be for 250,000 user-days annually. Access areas would be provided adjacent to the reservoir and in the parks for fishermen. The reservoir would meet the needs for 73,000 user-days annually for fishing in 1975 and 83,000 by the year 2000. Storage of water for the irrigation of about 500 acres of land by the year 2000 would be provided.

The reservoir would be operated to maintain

AXSON PROJECT

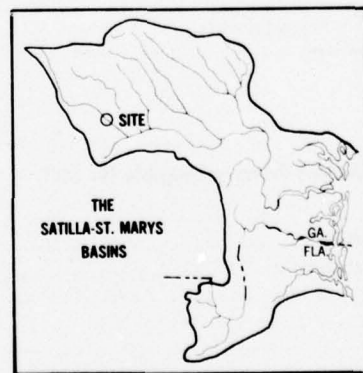
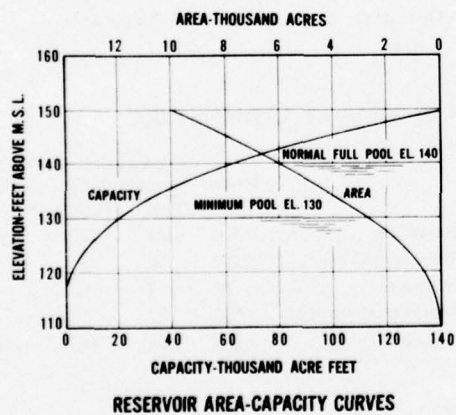
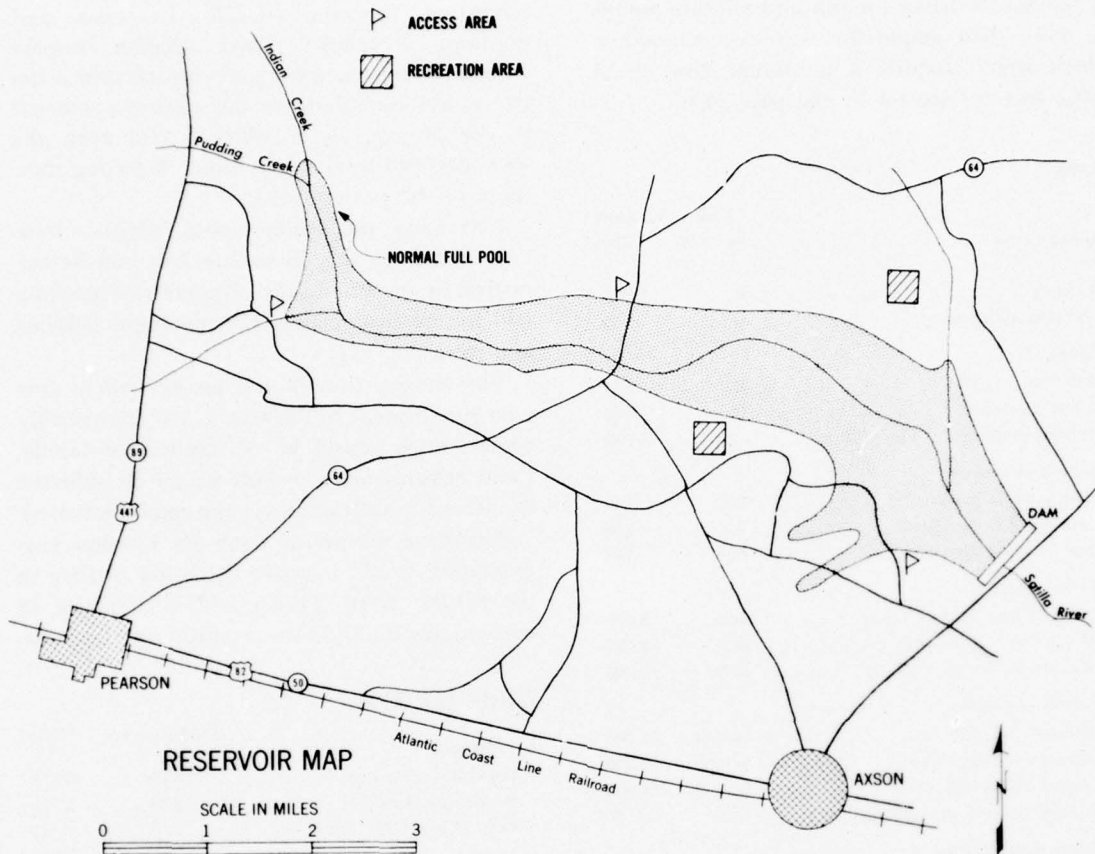


Figure 4.3

a minimum flow of 140 cubic feet per second below the dam and to fluctuate the pool level so as to minimize mosquito and other vector problems. This 140 cubic feet per second flow in the Satilla River for fish and wildlife would be more than ample for pollution abatement which would require a minimum flow of 28 cubic feet per second by the year 2000.

Data

	Unit	Amount
Drainage area	sq. mile	400
Dam		
Length	ft.	2,175
Maximum height	ft.	50
Spillway		
Effective length	ft.	845
Crest elevation	ft.	140
Design discharge at elev. 148 ft.	c.f.s.	76,000
Reservoir elevations		
Normal full pool	ft.	140
Minimum design pool	ft.	130
Maximum design pool	ft.	148
Reservoir areas		
Normal full pool	acre	6,000
Minimum design pool	acre	2,700
Maximum design pool	acre	9,000
Reservoir capacities		
Normal full pool	acre-ft.	61,000
Minimum design pool	acre-ft.	20,000
Maximum design pool	acre-ft.	124,000
Runoff volume, normal full pool	inch	2.9
Storage requirements		
For irrigation	acre-ft.	500
For streamflow regulation and evaporation losses, etc.	acre-ft.	40,500
Design minimum flow required in stream below dam	c.f.s.	140

Benefits

Annual Equivalent Primary Tangible (\$1,000)

Recreation	273
Fish and wildlife	141
Pollution abatement	297
Irrigation	3
Total	714

Impacts

This reservoir would also provide primary tangible and intangible benefits as well as secondary tangible and intangible benefits from recreation, fish and wildlife, irrigation, and pollution abatement. These benefits, coupled with land enhancement and construction activity, would contribute to the economic impacts of the project, all of which would assist the local governmental subdivisions in paying their share of the project costs.

Recreation and fishing would stimulate business activity in the immediate area and be evidenced by increased sales of gasoline, recreation and fishing equipment, food, beverage, lodging, and services.

The construction of the project would provide employment in the area in the construction trades which would be of importance locally. Land enhancement benefits would be reflected in increased tax revenues in the county involved.

The large releases of water for low-flow augmentation would improve the water quality in the Satilla River. This would be a factor in encouraging industry to establish in this area.

Costs (\$1,000)

	Early action	Total
Investment		
Dam and reservoir	3,875	3,875
Recreation facilities	1,095	1,370
Fish and wildlife facilities	45	45
Total	5,015	5,290

Annual Equivalent

Investment	186.9
Operation, maintenance, and replacements	82.1
Total	269.0

Allocation of Costs (\$1,000)

	Investment	Annual equivalent		OM&R at year 2000
	Total	OM&R		
Recreation	2,340	151	71.9	82.3
Fish and wildlife	2,240	90	8.8	8.8
Irrigation	20	1	0.1	0.1
Pollution abatement	690	27	2.3	2.3
Total	5,290	269	82.1	93.5

NASSAU RIVER EMBAYMENT PROJECT

Location

The Nassau River Embayment is on the Nassau River in Nassau and Duval Counties, Florida. The damsite is approximately 12 river miles above the mouth of the Nassau River and about 3 miles, in a straight line, downstream of U. S. Highway No. 17 Bridge across the Nassau River.

Plan

The proposed project consists of a dam and reservoir, a navigation lock, a canal in Mills Creek with a turning basin, a recreation area, a wildlife management area for waterfowl, and water-access areas.

The dam would be constructed in a marshy area where the river banks are relatively close and high. General geologic information indicates that a safe structure could be built if proper methods are used. The dam would be an earthfill structure with a 1,600-foot long concrete steel-sheet-pile fixed-crest spillway and a concrete navigation lock. This lock would be founded on piling. For use in maintaining brackish water in the reservoir between 10 and 50 percent of sea water salinity by utilizing the tidal flow below the dam, four 72-inch circular culverts containing automatic controlled and manually operated gates would be provided. In addition, two pumps with a capacity of 50 cubic feet per second would be provided to permit the addition of salt water to the reservoir without drawing down the normal pool. Sector lock gates, which could be opened and closed against a low head of water, would be provided to permit the navigation lock chamber to be used as a sluice for lowering the pool and for replenishing the pool with tidal flows. This use would occur at rare intervals.

The reservoir would have a maximum length of about 15 miles and extend up to the end of the Nassau River and into the Mills Creek, Thomas Creek, Boggy Swamp, and Plummer Swamp tributaries. A canal in Mills Creek for flood control and the navigation of small recreation and fishing craft would extend from the

upstream end of the reservoir to Callahan, Florida. A causeway supporting an unpaved road to a bridge across Mills Creek, both owned by a pulpwood company, would be altered. The bridge would be rebuilt and raised and the causeway fill would be raised and extended. Land for the dam and reservoir, to elevation 10 feet, is estimated at 35,500 acres. In addition, about 300 acres would be required for recreation and other purposes.

Data

	Unit	Amount
Drainage area	sq. mile	339
Tidal elevation		
Mean low water	ft.	-1.7
Mean high water	ft.	2.2
Normal tidal range	ft.	3.9
Spring high water	ft.	2.6
Spring tidal range	ft.	4.3
Maximum tidal height (hurricane conditions estimated)	ft.	9.3
Dam		
Maximum height	ft.	30
Top elevation	ft.	10
Effective length	ft.	12,300
Spillway (fixed crest)		
Crest elevation	ft.	4.8
Effective length	ft.	1,600
Estimated average discharge	c.f.s.	250
Design flood pool elevation	ft.	7.2
Design discharge at elevation 7.2 ft.	c.f.s.	16,000
Reservoir elevations		
Normal full pool	ft.	5
Minimum pool	varies for operation purposes	
Reservoir areas		
Normal full pool	acre	25,000
Maximum design pool	acre	30,000
Reservoir capacities		
Normal full pool	acre-ft.	73,000
Maximum design pool	acre-ft.	134,000
Runoff volume, full pool	inch	4
Lock		
Chamber size	ft.	125x30
Elevation of sill	ft.	-6.7
Canal		
Depth at mean low water	ft.	5
Bottom width	ft.	50

NASSAU RIVER EMBAYMENT PROJECT

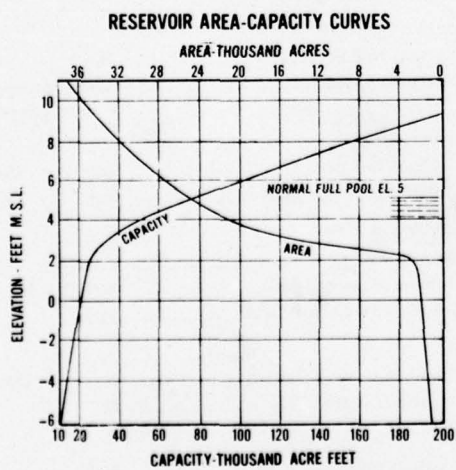
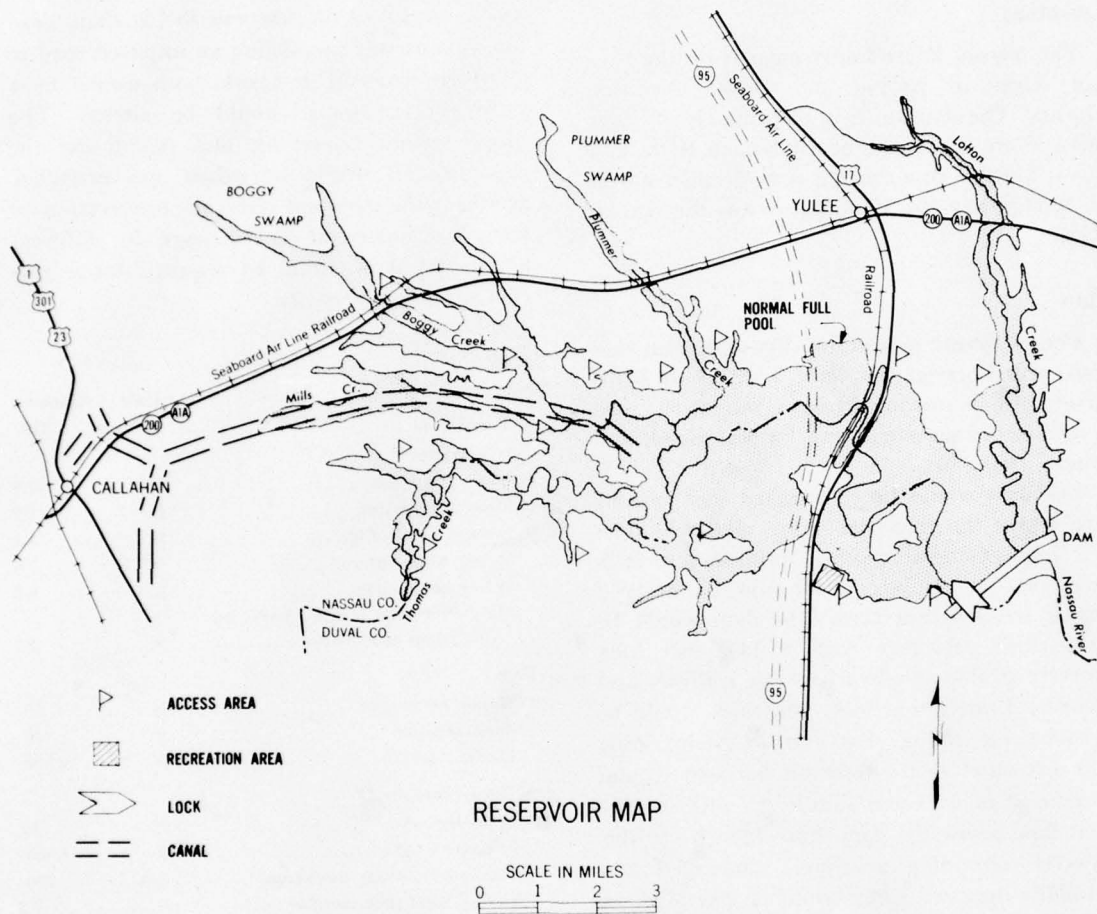


Figure 4.4

Benefits

The greatest benefit to be derived from the project will be the development of practical means of utilizing large areas of undeveloped saline marshes along the Atlantic and Gulf coasts of which there are about 500,000 acres in the Southeast River Basins area.

Considerable research and experimental work would be required prior to undertaking the design and construction of the project to determine methods and means of reservoir operation for maintaining the desired degree of salinity. During low flows and high tides, the reservoir might become too salty. The salt water might not mix adequately and there could be a vertical stratification of salt water in the lower depths of the reservoir. The upper end of the reservoir might be fresher than the downstream end of the reservoir. Wind and wave action and boat traffic on the reservoir should stir up the water and help to mix it, but this might not give the desired results. The failure of brackish and fresh water to mix would reduce the fish and wildlife benefits and increase the cost for reservoir maintenance due to noxious weeds which grow in shallow fresh water.

Notwithstanding the problems described above, it is expected that the minimum primary tangible benefits which would accrue from the project, in terms of hunting, fishing, recreation, flood control, and vector control would be adequate to justify the project.

A major portion of the demand for fishing use is expected to originate in the Jacksonville, Florida, metropolitan area, which borders on the project and is about 15 miles distance from the city limits of Jacksonville. The demand in this metropolitan area is expected to increase from 1.1 million user-days of sport fishing in 1955 to 1.7 million user-days by 1975 and 2.9 million user-days by 2000. The extent to which this demand will be expanded at the Nassau River Embayment will be influenced greatly by the quality of sport fishing and hunting afforded.

Strategically located with respect to U. S. Highways No. 1, 17, 23, and 301, and proposed

Interstate Highway, Route 95, it would be easily accessible to a large segment of the public visiting in or traveling through this portion of the basins.

If the desired level of salinity and aquatic plant control is attained, it is expected that the project will sustain over 365,000 user-days of sport fishing and over 13,000 user-days of hunting annually by 1975. Should the desired level of salinity and aquatic plant control not be attained, it is expected that the impoundment will afford at least 250,000 user-days of fishing and 4,000 user-days of hunting by 1975 which would economically justify the project. The project has been evaluated on the basis that the desired salinity will be obtained in the reservoir and the costs have been estimated on the basis of providing the needed facilities.

The recreation area would contain facilities for boating, swimming, camping, picnicking, and sightseeing. These facilities would accommodate 60,000 user-days annually.

In addition to the benefits to recreation and fish and wildlife, the channel improvement on Mills Creek upstream from the reservoir would reduce flood damages in Callahan, Florida, and vicinity. These benefits are estimated to be \$40,000 annually. Fishing and pleasure craft would be provided with a year-round navigation channel from Callahan, Florida, to the reservoir area with access to the ocean. These benefits are included in those estimated for recreation and fish and wildlife.

The annual vector control benefits of \$10,000 have been determined as the value equal to the cost of the work that would be required to provide equivalent mosquito control if the project were not constructed. The impoundment also will be helpful in reducing the breeding of sand flies and other biting insects although a monetary value for this has not been determined.

No alternative sites were found which were considered to be suitable to meet the requirements at less cost than the Nassau River Embayment. There is a unique opportunity to undertake research which may have far reaching and beneficial effects for future generations.

Annual Equivalent Primary Tangible (\$1,000)

Recreation	60
Flood control	40
Fish and wildlife	780
Vector control	10
Total	890

Impacts

A reservoir of this unique nature, bordering the metropolitan Jacksonville area, would have economic impacts far exceeding the primary benefits used in evaluation. The recreation and fish and wildlife activities would attribute to extensive impacts stemming from sales of gasoline, fishing and recreation equipment, food and beverage, lodging, and services. Home construction, increased land values, and increased sources of tax revenue would benefit the local economies. New opportunities for employment would be created in the services, trades, and construction categories. All would be helpful to the local area in paying the local portion of the project cost.

The flood control benefits from the project would be largely primary. However, the economic impacts from these benefits and the secondary benefits such as more intensive land use and land enhancement would affect the economy of Callahan. Mosquito control would also have impacts stemming from land enhancement and a healthier environment.

The experimental nature of the project would furnish data which might have widespread use for the planning and construction of similar projects in the southeastern part of the United States with corresponding economic impacts.

Costs (\$1,000)

	Early action	Total
Investment		
Dam and reservoir	2,530	2,530
Canal	860	860
Recreation facilities	180	180
Fish and wildlife facilities	330	330
Total	3,900	3,900
Annual Equivalent		
Investment		140.7
Operation, maintenance, and replacements		85.3
Total		226.0

Allocation of Costs (\$1,000)

	Investment	Annual equivalent Total	OM&R	OM&R at year 2000
Fish and wildlife	2,960	170	63.3	63.3
Recreation	180	20	12.7	13.2
Flood control	620	31	9.0	9.0
Vector control	140	5	0.3	0.3
Total	3,900	226	85.3	85.8

Special Considerations

Project Operation

Since the project is proposed as an experimental development to provide a prototype in fish and wildlife management research, it is contemplated that various plans of operation will be used to determine the optimum plan for beneficial uses. One plan of operation would be to maintain a constant normal pool level of elevation 5.0 insofar as possible. The normal pool level is established at 0.2 feet above the spillway crest since the average runoff at 250 cubic feet per second would be passed over the spillway at pool elevation 5.0 feet. During periods of above average runoff, the sluices and lock chamber would be utilized for release of storage in addition to flows over the uncontrolled spillway crest. When runoff from the contributing drainage area becomes less than the evaporation and seepage losses, plus lockage water, the pumps would be operated to maintain the normal pool level and the desired salinity in the reservoir.

Another plan of operation might provide for a seasonal variation of the pool level so that all sluice and lock gates could be maintained in an open position at the time of fish runs to encourage the entrance of salt-water fish into the reservoir. Following capture of the desired species of fish, the gates would be closed and the pool level raised to the spillway crest either by storage of surface runoff or by pumping into the reservoir. During spring tides, it would be possible to open the sluice and lock gates to permit the entrance of salt water for increasing salinity. During extreme hurricane wind tides, it is expected that the level of salt water below the dam will be above the spillway crest, resulting in a complete flooding of the reservoir area with salt water.

During the occurrence of severe droughts, such as that of 1954, it would not be possible to maintain the normal pool at the spillway crest. It is estimated that, with only surface runoff into the reservoir, the pool level would drop to elevation 2.4, or only 0.2 foot above the mean high water tide. A higher minimum pool, if desired, could be maintained by pumping.

The reservoir area would be maintained to

prevent pest plants, such as water hyacinths, cat-tails, and alligator weeds, from getting a foothold in the reservoir. This would be accomplished by frequent patrols over the reservoir and the elimination of the pest weeds soon after they are discovered.

The project would also be operated to minimize vector problems as well as for the optimum production and utilization of fish and waterfowl.

UPPER HURRICANE CREEK PROJECT

Location

Upper Hurricane Creek dam and reservoir site is on Hurricane Creek in Jeff Davis County, Georgia. The damsite is about one-half mile downstream of the confluence of Whitehead Creek and Hurricane Creek.

Plan

The proposed project consists of a dam and reservoir, one park, and water-access areas. It would provide benefits from recreation, fishing, irrigation, and pollution abatement. Storage in the reservoir would be provided for low-flow augmentation for fish, irrigation, and the dilution of wastes.

The dam would be an earthfill structure with a concrete gravity spillway and apron and a steel piling cutoff wall at the upstream end of the spillway. The reservoir would extend up Hurricane Creek about 7 miles above the dam. Land needed for the dam and reservoir to the spillway design pool elevation is estimated to be 8,000 acres. In addition, about 1,600 acres would be needed for a park, access areas, and other public use.

This project is phased for construction in the period 1975 to 2000. It would provide annually 150,000 user-days of recreation and 67,000 user-days of fishing. The reservoir would be operated to maintain a minimum flow of 50 cubic feet per second below the dam and to fluctuate the reservoir pool so as to minimize mosquito and other vector problems. The minimum flow of 50 cubic feet per second in Hurricane Creek is needed for fish and wildlife. This flow would be more than ample to meet the minimum flow

requirements of about 4 cubic feet per second for pollution abatement.

Data

	Unit	Amount
Drainage area	sq. mile	97
Dam		
Length	ft.	2,450
Maximum height	ft.	40
Spillway		
Effective length	ft.	400
Crest elevation	ft.	197
Design discharge at elev. 205 ft.	c.f.s.	36,000
Reservoir elevations		
Normal full pool	ft.	197
Minimum design pool	ft.	190
Maximum design pool	ft.	205
Reservoir areas		
Normal full pool	acre	5,400
Minimum design pool	acre	3,300
Maximum design pool	acre	8,000
Reservoir capacities		
Normal full pool	acre-ft.	54,000
Minimum design pool	acre-ft.	24,000
Maximum design pool	acre-ft.	105,000
Runoff volume, normal full pool	inch	10.4
Reservoir requirements		
For irrigation	acre-ft.	500
For streamflow regulation and evaporation losses, etc.	acre-ft.	29,500
Design minimum flow required in stream below dam	c.f.s.	50

Benefits

Annual Equivalent Primary Tangible (\$1,000)

Recreation	210
Fish and wildlife	125
Irrigation	11
Pollution abatement	75
Total	421

UPPER HURRICANE CREEK PROJECT

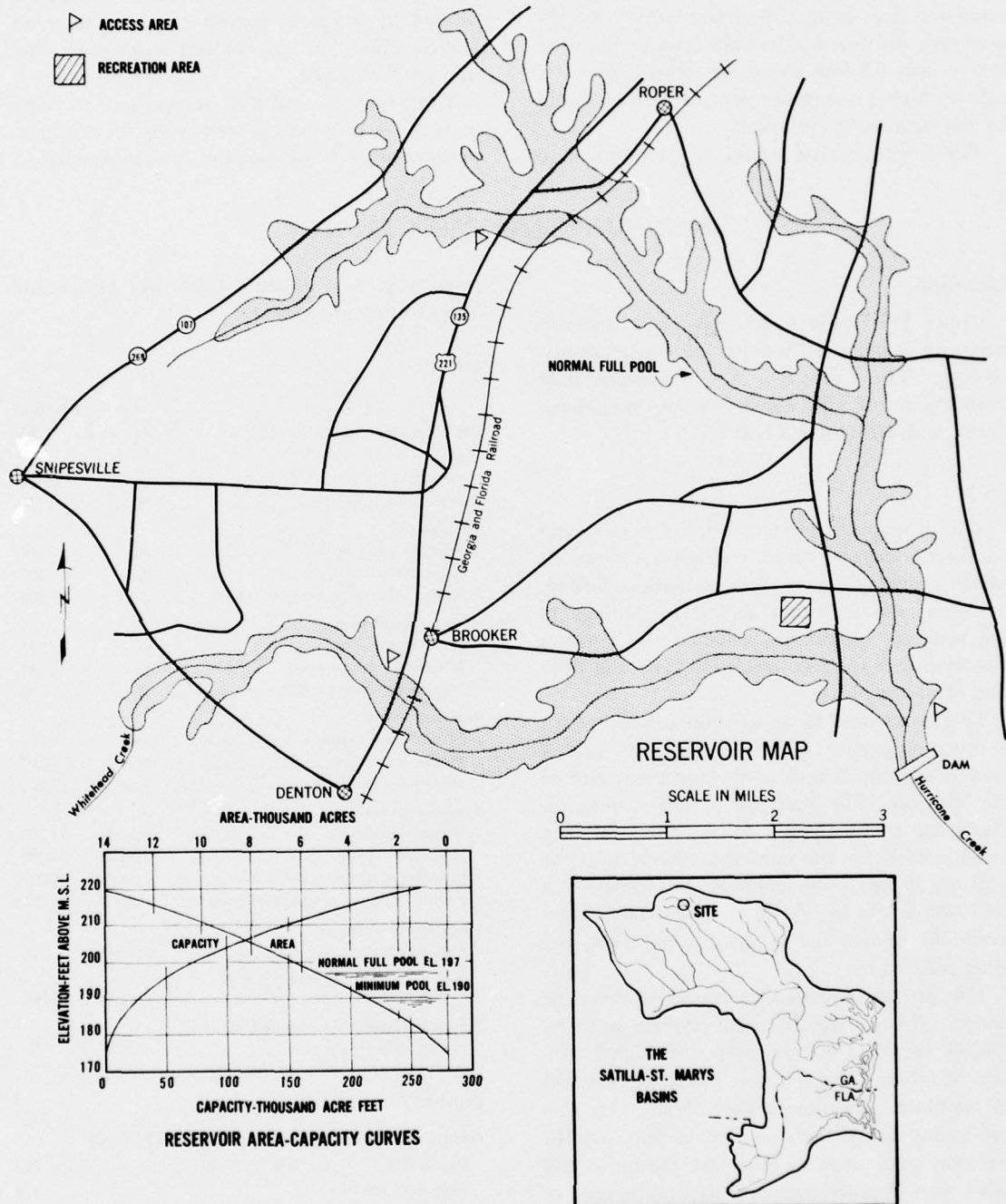


Figure 4.5

Impacts

There are many benefits to the area from the project which would directly or indirectly increase the ability and willingness of local interest to participate in the cost of the project.

Construction of the dam and reservoir would, during the installation period, provide employment, sales and materials and equipment, increased housing and food service opportunities, and many other associated benefits.

After construction of the project, new business would be attracted to the area and many new opportunities for employment would occur in new trades and services such as boat building, rental and repair, swimming and water skiing, equipment and supplies, food services, and automobile services. The dilution of the water in Hurricane Creek to reduce the effects of pollution, after secondary treatment, would be one means to encourage industry to be established, particularly in the vicinities of Alma and Blackshear, Georgia.

As a result of visitations to the reservoir, benefits would accrue from increased employment

opportunities in motels, restaurants, auto and boat sales and services, and souvenir manufacture and sales.

Costs (\$1,000)

	Early action	Total
Investment		
Dam and reservoir	0	4,270
Recreation facilities	0	955
Fish and wildlife facilities	0	45
Total	0	5,270

Annual Equivalent

Investment	190.8
Operation, maintenance, and replacements	64.2
Total	255.0

Allocation of Costs (\$1,000)

	Investment	Annual equivalent	OM&R at	OM&R year 2000
	ment	Total	OM&R	
Recreation	1,980	126	53.7	55.2
Fish and wildlife	2,440	97	8.4	8.4
Irrigation	30	1	0.2	0.2
Pollution abatement	820	31	1.9	1.9
Total	5,270	255	64.2	65.7

BROXTON CREEK PROJECT

Location

Broxton Creek damsite is on Broxton Creek about 4 miles southeast of Broxton, Georgia, about 5 miles north of Douglas, Georgia, and about 2 miles upstream of the confluence of Seventeen Mile and Broxton Creeks. The reservoir site is in Coffee County, Georgia.

Plan

The proposed project consists of a dam and reservoir, a park, and water-access areas. It would provide benefits for recreation, fish, and pollution abatement.

The dam would be an earthfill structure with a concrete gravity spillway and apron and a steel piling cutoff wall at the upstream end of the spillway. Land needed for the dam and reservoir to the design pool elevation totals about 3,400 acres. In addition, about 1,600 acres would be needed for a park, access, and other public use. Recreation facilities to be provided would be for boating, water skiing, swimming, camp-

ing, picnicking, and sightseeing.

The recreation facilities would handle 100,000 user-days annually. Access to the reservoir would be provided for fishermen. The project would furnish annually 5,000 user-days of fishing. The project is phased for construction by the year 2000.

The reservoir would be operated to maintain a minimum flow of 11 cubic feet per second in Seventeen Mile Creek at its confluence with Broxton Creek for the dilution of wastes from Broxton and Douglas, Georgia.

Data

	Unit	Amount
Drainage area	sq. mile	50
Dam		
Length	ft.	2,200
Maximum height	ft.	35
Spillway		
Effective length	ft.	300
Crest elevation	ft.	237
Design discharge	c.f.s.	40,000

BROXTON CREEK PROJECT

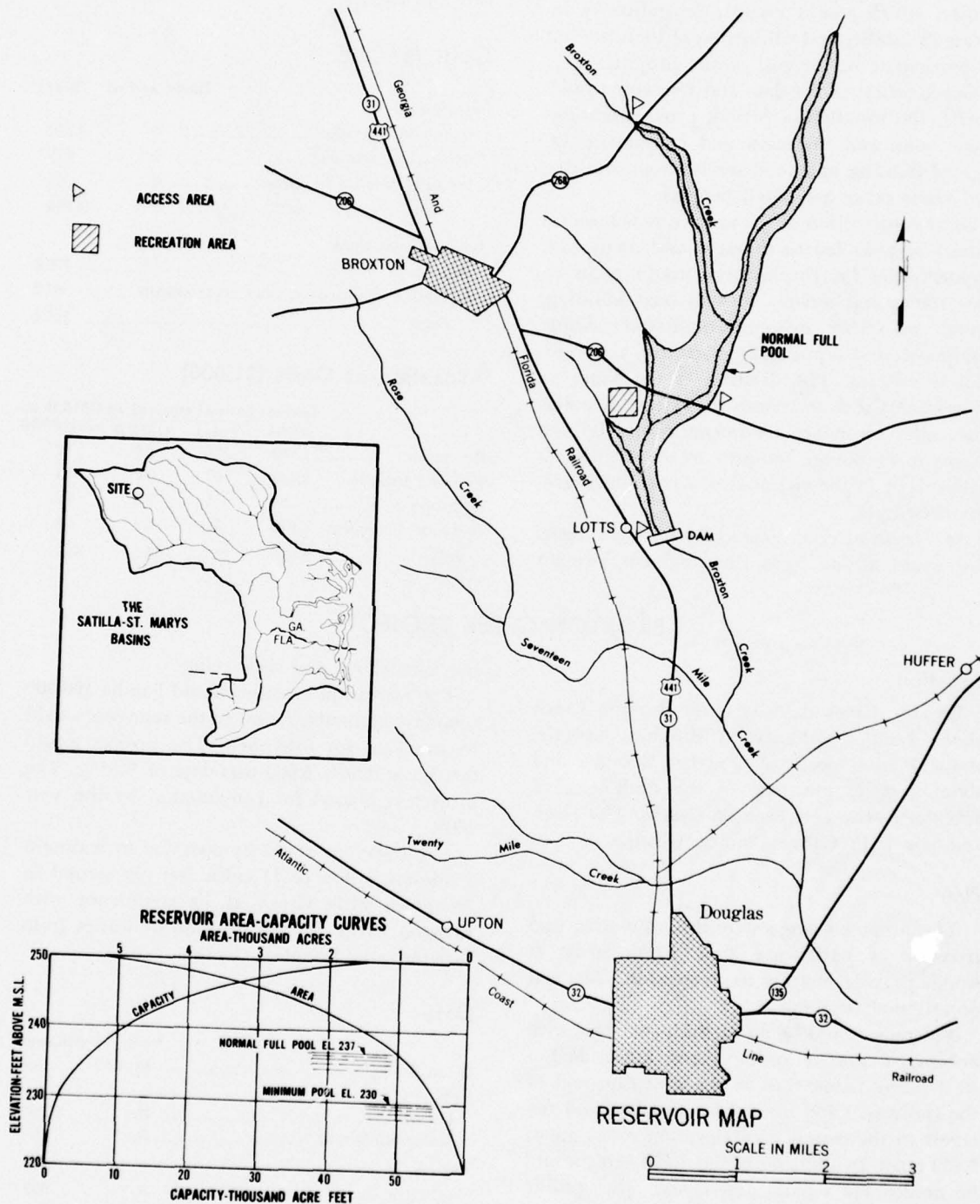


Figure 4.6

	Unit	Amount
Reservoir elevations		
Normal full pool elevation	ft.	237
Minimum design pool elevation	ft.	230
Maximum design pool	ft.	247
Reservoir areas		
Normal full pool	acre	1,000
Minimum design pool	acre	400
Maximum design pool	acre	3,000
Reservoir capacities		
Normal full pool	acre-ft.	7,000
Minimum design pool	acre-ft.	2,000
Maximum design pool	acre-ft.	28,000
Runoff volume, normal full pool	inch	2.6
Reservoir requirements for streamflow regulation and evaporation losses, etc.		
Design minimum flow required in Seventeen Mile Creek below dam	c.f.s.	11

Benefits

Annual Equivalent Primary Tangible (\$1,000)

Recreation	156
Fish and wildlife	7
Pollution abatement	200
Total	363

Impacts

The construction of the dam and reservoir would, during the installation period, provide employment, sales of materials and equipment, increased housing and food service opportunities, and many other associated benefits.

After construction of the reservoir, new business would be attracted to the area and many new opportunities for employment would occur in new trades and services such as boat building,

rental and repair, swimming and water skiing, equipment and supplies, food services, and automobile services. The augmentation of the low flows in Seventeen Mile Creek would produce a better quality of water and it would be one means to encourage industry to establish in the area.

As a result of the visitations to the reservoir, benefits would accrue from increased employment opportunities in motels, restaurants, auto and boat sales and services, and souvenir manufacture and sales.

All of these impacts will affect the financial ability of the local political subdivisions to pay their share of the project costs.

Costs (\$1,000)

Investment	Early action	Total
Dam and reservoir	0	2,000
Recreation facilities	0	400
Fish and wildlife facilities	0	30
Total	0	2,430

Annual Equivalent

Investment	88
Operation, maintenance, and replacements	40
Total	128

Allocation of Costs (\$1,000)

	Investment	Annual equivalent Total	OM&R at year 2000
Recreation	1,090	69	30.0
Fish and wildlife	100	6	2.2
Pollution abatement	1,240	53	7.8
Total	2,430	128	40.0

WATER ACCESS AREAS

Location

The water-access areas designed to provide the public with access facilities to desirable recreation and fishing areas, would be located along the Satilla, St. Marys, and Nassau Rivers, at and along the coastal waters of the Satilla-St. Marys basins, and adjacent to small reservoirs. Not included in this part of the plan are the access areas adjacent to proposed large dams and reservoirs and the single-purpose recreation and fish and wildlife programs.

Plan

Four different kinds of access areas would be developed. Type A, Type B, and Type C access areas would be for fish and wildlife, and recreation. Type D would be for only fish and wildlife. The average areas would be 75 acres for Type A, 40 acres for Type B, 10 acres for Type C, and 2 acres for Type D. Types A, B, and C access areas would have facilities for boating, camping, swimming, fishing, limited hunting, picnicking, sightseeing, parking, water supply, sanitation,

and access to these facilities. Type D access areas would have facilities for parking, access to the site, fishing, and hunting.

A total of 63 access areas would be installed by 2000. Thirty of the sites would be used for recreation and fish and wildlife and 33 would

be for fish and wildlife with no facilities for recreation. By 1975, 25 sites would be developed. Of the 25 sites, 5 would be located on the coast and 20 would be located adjacent to fresh-water streams and small reservoirs.

Expected use would be as follows:

Data

Type	Georgia			Florida			Basins Total		
	User-days			User-days			User-days		
	No.	Recreation	Fish and wildlife	No.	Recreation	Fish and wildlife	No.	Recreation	Fish and wildlife
Year 1975									
A	5	500,000	10,000	2	200,000	4,000	7	700,000	14,000
B	8	480,000	16,000	1	60,000	2,000	9	540,000	18,000
C	4	160,000	8,000	0	0	0	4	160,000	8,000
D	4	0	8,000	1	0	2,000	5	0	10,000
Total	21	1,140,000	42,000	4	260,000	8,000	25	1,400,000	50,000
Year 2000									
A	10	1,000,000	20,000	5	500,000	10,000	15	1,500,000	30,000
B	10	600,000	20,000	1	60,000	2,000	11	660,000	22,000
C	4	160,000	8,000	0	0	0	4	160,000	8,000
D	23	0	46,000	10	0	20,000	33	0	66,000
Total	47	1,760,000	94,000	16	560,000	32,000	63	2,320,000	126,000

Benefits

Annual Equivalent Primary Tangible (\$1,000)

	Georgia	Florida	Total
Recreation	2,996	940	3,936
Fish and wildlife	47	16	63
Total	3,043	956	3,999

Impacts

The access areas would provide a wide distribution of low cost facilities to make the streams and coastal areas available to people all over the basins. The use of private land along water bodies is becoming more and more restricted. This restriction limits the use of the basins water bodies and makes fishing and other water-based activities more and more difficult for the public. A main objective of the access areas is to keep the recreation and fishing areas available to the public.

It is recognized that the basins rivers will be improved for fishing and other recreational uses when the upstream storages are provided to permit quality control. However, none of the benefits from the access areas have been assigned

to the water-storage projects in the current analysis.

The access sites will provide convenient points to reach the streams and coastal waters for fishing, recreation, water sampling, stream gaging, and other purposes.

Costs (\$1,000)

Investment	Georgia	Florida	Total
Early action	5,292	1,115	6,407
Total	8,180	2,450	10,630

Annual Equivalent

Investment	296	88	384
Operation, maintenance, and replacements	495	152	647
Total	791	240	1,031

Allocation of Costs (\$1,000)

Investment	Georgia	Florida	Total
Recreation	7,600	2,240	9,840
Fish and wildlife	580	210	790
Total	8,180	2,450	10,630

Annual Equivalent

	Georgia	Florida	Total
Investment			
Recreation	275	81	356
Fish and wildlife	21	7	28
Total	296	88	384
Operation, maintenance, and replacements			
Recreation	470	144	614
Fish and wildlife	25	8	33
Total	495	152	647
Total			
Recreation	745	225	970
Fish and wildlife	46	15	61
Total	791	240	1,031

Operation, Maintenance, and Replacements at Year 2000

	Georgia	Florida	Total
Recreation	470	144	614
Fish and wildlife	25	8	33
Total	495	152	647

Special Considerations

The proposed access areas have not been located precisely. They may be located at highway crossings or other suitable sites available in the vicinities.

UPSTREAM WATERSHED PROJECTS

Location

While no specific locations are selected for final development, watershed areas were analyzed as typical projects.

Plan

Multiple-purpose flood prevention and drainage projects are proposed on tributary streams draining some 1.2 million acres between 1960 and 2000, 600,000 acres in Georgia, and 600,000 acres in Florida, in the Satilla-St. Marys basins. The structural works of improvements would protect and provide for the improvement of agricultural lands and other areas. As a result, many of the desired land-use changes would be made possible which would more effectively utilize, protect, and develop the land and water resources of the basins.

Changes in the criteria for project selection, evaluation, installation, and cost sharing due to legislative changes which cannot be predicted, or increased local interest, or other factors, such as changes in the amount of watershed technical assistance, could substantially change the estimate and result in a different rate of watershed project installations. The possibility of changes in the watershed program is recognized. Appropriate recognition of actual developments and resulting modifications can be accomplished as a part of keeping the comprehensive plan up to date.

In developing detailed plans for each of the

upstream watersheds, the needs for all purposes should be considered and facilities included wherever needed and feasible. Adjustments in individual upstream watershed proposals in the plan could and should be made as appropriate to maximize all of the benefits and to reflect costs allocated to each purpose served.

Benefits

Annual Equivalent Primary Tangible (\$1,000)

	Georgia	Florida	Total
Flood prevention	210	1,113	1,323
Drainage	390	1,181	1,571
Total	600	2,294	2,894

Impacts

Corrective measures to prevent soil erosion together with utilization of sediment storage capacities provided in upstream structures will reduce sediment storage requirements in downstream reservoirs.

Upstream watershed projects will provide watershed protection, flood prevention, and water resources development for other purposes in the upstream areas. The structural works of improvement included will result in reducing the average annual floodwater and sediment damages occurring under existing conditions on a substantial area of flood plains in the small-stream watersheds. Protection provided for these flood plain areas will enable landowners to use more intensively some highly productive areas which are now in low value production and use because of the existing flood hazards.

Many opportunities exist in the proposed reservoirs in the upstream watersheds for recreation facilities, for fish and wildlife developments, for storing water and other beneficial uses, and for reducing floodwater and sediment damages. To the extent the reservoirs are made available to and managed for public use, they will provide substantial portions of the projected needs for recreation and fish and wildlife as well as other purposes.

Costs (\$1,000)

Investment	Georgia	Florida	Total
Early action			
Flood prevention	2,297	3,090	5,387
Drainage	4,265	3,348	7,613
Total	6,562	6,438	13,000
Total			
Flood prevention	2,314	3,946	6,260
Drainage	4,306	4,214	8,520
Total	6,620	8,160	14,780

Annual Equivalent

	Georgia	Florida	Total
Installation	239.7	295.6	535.3
Operation, maintenance, and replacements	80.1	86.9	167.0
Total	319.8	382.5	702.3

Allocation of Costs (\$1,000)

Investment	Georgia	Florida	Total
Flood prevention	2,314	3,946	6,260
Drainage	4,306	4,214	8,520
Total	6,620	8,160	14,780

Total Annual Equivalent

Flood prevention	111.8	183.5	295.3
Drainage	208.0	199.0	407.0
Total	319.8	382.5	702.3

Operation, Maintenance, and Replacements at Year 2000

Flood prevention	28.1	41.9	70.0
Drainage	52.0	45.0	97.0
Total	80.1	86.9	167.0

WATER SUPPLIES

Location

The water supply programs would be basin-wide.

Plan

The programs for domestic, municipal, and industrial uses of water include the development or improvement of water supplies, treatment facilities, and distribution systems. Water made available under these programs would serve domestic needs for 4.4 million gallons per day, municipal needs for 54.7 million gallons per day, and industrial needs for 329.4 million gallons per day by the year 2000.

Data

	Number
Domestic Supplies (projected needs to 2000)	
New drilled wells	1,300
Wells to be sealed and covered	7,300
Wells needing power pumps and pressure systems	2,000
Rehabilitation of wells	9,800
Municipal Supplies (projected needs to 2000)	
Municipalities	29
Systems needing:	
Source improvement	22
Water treatment	26

Number

Elevated storage tanks needed	32
Distribution systems or extension required	27

The industrial water-supply program would consist of the installation of new wells, surface water intakes, treatment plants, storage facilities, and expansion of municipal distribution systems for some of the industrial plants located in the basins.

Benefits

Annual Equivalent Primary Tangible

Tangible benefits are assumed to be at least equal to the cost of the cheapest alternative.

Costs (\$1,000)

Investment	Georgia	Florida	Total
Early action			
Domestic	3,664	276	3,940
Municipal	6,250	954	7,204
Industrial	470	226	696
Total	10,384	1,456	11,840

	Georgia	Florida	Total
Total			
Domestic	3,664	276	3,940
Municipal	15,020	1,450	16,470
Industrial	1,416	674	2,090
Total	20,100	2,400	22,500

Annual Equivalent

Domestic			
Investment	110	8	118
Operation, maintenance, and replacements	44	4	48
Subtotal	154	12	166
Municipal			
Investment	345	38	383
Operation, maintenance, and replacements	964	133	1,097
Subtotal	1,309	171	1,480

	Georgia	Florida	Total
Industrial			
Investment	157	15	172
Operation, maintenance, and replacements	1,031	416	1,447
Subtotal	1,188	431	1,619
Total	2,651	614	3,265

Operation, Maintenance, and Replacements at Year 2000

Domestic	110	8	118
Municipal	1,796	242	2,038
Industrial	1,692	786	2,478
Total	3,598	1,036	4,634

Allocation of Costs

All costs are allocated to water supplies.

BRUNSWICK HARBOR

Location

The port of Brunswick is located on the Atlantic coast in the city of Brunswick, Glynn County, Georgia.

Plan

The harbor includes the port and the improved channel in *St. Simons Sound*, Brunswick River, East River, Turtle River, and Academy Creek. There is about 30 miles of deep-water frontage. The improved channel crosses the Intracoastal Waterway.

In 1960, the port of Brunswick consisted of four deep-draft wharves and numerous shallow-draft wharves. Another deep-water wharf was added in 1962. By mid-1963, a new general cargo berth, now under construction, will have been completed. The new facility will include two gantry cranes and transit sheds with modern truck and rail off-loading platforms.

In gearing for the future growth of the basins, Colonels Island was purchased in 1962. This 10,000-acre island, near Brunswick, is proposed as a site for industrial development. It lies adjacent to the existing deep water channel in Brunswick Harbor. The main channels are 500 feet wide and 32 feet deep over the ocean bar; 400 feet wide and 30 feet deep through *St. Simons Sound*, Brunswick River, and East River to the foot of Second Avenue, thence 350 feet wide and 27 feet deep to the confluence with Academy

Creek; and 300 feet wide and 30 feet deep in the Turtle River to the wharf of the Allied Chemical Company. These facilities are expected to be adequate for the projected traffic to the year 1975. Projections of waterborne commerce movement indicate that during the period 1975 to 2000, additional port facilities and channel improvements will be needed.

Data

The Georgia Ports Authority expended \$1,586,000 for the deep-water wharf completed in Brunswick, on September 30, 1961. Funds are authorized in the amount of \$1,268,000 for the construction of the deep-water wharf scheduled for completion in April 1963, and \$2,600,000 has been authorized for the purchase and port improvements of Colonels Island, Brunswick Harbor. In addition to these expenditures, the Brunswick Port Authority has spent \$1,250,000 for the construction of a deep-water berth in 1959 and \$110,000 in 1962 for improvements to this wharf. It has also spent \$1,000,000 for the purchase of land for the three new deep-water wharfs constructed from 1959 to 1963.

These developments should be adequate for the needs of the harbor until 1975. The plan of improvement, between 1975 and 2000, would include the expansion and modernization of the present facilities as well as an additional deep-water wharf in the East River to match the

BRUNSWICK HARBOR

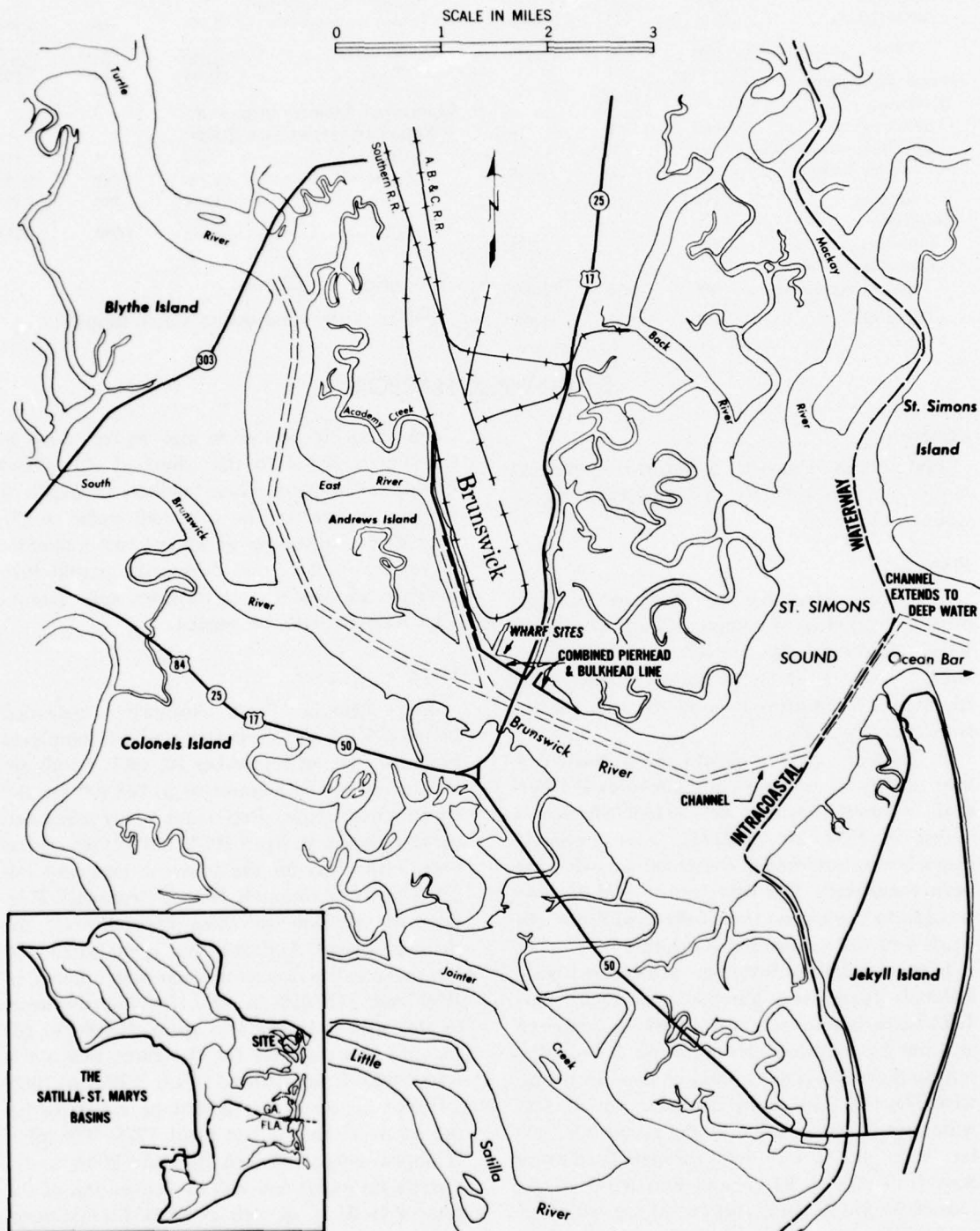


Figure 4.7

numbers and types of ships and barges moving the commerce of the future. The channel depth would be increased from 32 feet to 38 feet below mean low water over the ocean bar; and to 36 feet deep and 400 feet wide in St. Simons Sound, Brunswick River, and East River.

Benefits

Annual Equivalent Primary Tangible \$683,000

Impacts

The economic impacts from the harbor developments would stem largely from the effect on industrial developments in the area. Several large industries and many smaller ones utilize the port facilities with resulting savings in the overall production costs. These industries are thereby better able to compete with similar industries in other areas and as a result their production level is raised. The Brunswick area is the largest industrial area in the Satilla-St. Marys basins.

The industries contribute greatly to the economy of the area by contributing large sums for payrolls, materials, and services. These effects are distributed throughout the area and to lesser extents to the State and Nation.

The ports employ a large number of people, purchase materials and services for operating and maintaining the port facilities. The construction and channel dredging work would pro-

vide employment in the immediate area and require the purchase of materials and supplies.

The harbor facilities will encourage expansion of existing industries and help bring new industries into the area.

Although the estimated primary tangible benefits are less than the estimated tangible costs for the proposed facilities, the intangible and secondary benefits which would accrue from the improvements would have a value greater than the primary tangible benefits. The proposed improvements would permit more and larger ships to enter the harbor and would permit more regular ship arrivals at the ports and reduce delays in loading and unloading of the commodities. The increased traffic would generate many local and area benefits, in the form of increased trade, increased employment, and higher per capita income.

Costs (\$1,000)

	Early action	Total
Investment	0	8,910
Annual Equivalent		
Investment	0	384
Operation, maintenance, and replacements	0	474
Total	0	858

Allocation of Costs

All costs are allocated to navigation.

FERNANDINA BEACH HARBOR

Location

The port of Fernandina Beach is on the Atlantic coast just west of the city of Fernandina Beach, on the northwest end of Amelia Island, Nassau County, Florida.

Plan

The harbor includes the port, a dredged and jettied channel in Cumberland Sound along the Georgia-Florida boundary between Cumberland Island and Amelia Island, and a channel in Amelia River from Cumberland Sound to the

port. This latter portion of the channel is also a part of the Intracoastal Waterway.

The port anchorage area of about 160 acres provides a good shelter for deep-draft vessels. Across the ocean bar to Cumberland Sound the channel is 400 feet wide and 34 feet deep. In Cumberland Sound and a portion of the Amelia River, the channel is 400 feet wide, thence 300 feet to a 800-foot wide turning basin near the southerly end. Channel and turning basin depths are 28 feet. The port size is adequate for the improved facilities that will be required to handle projected traffic to the year 2000. After 1975, the channel depth should be increased.

FERNANDINA BEACH HARBOR

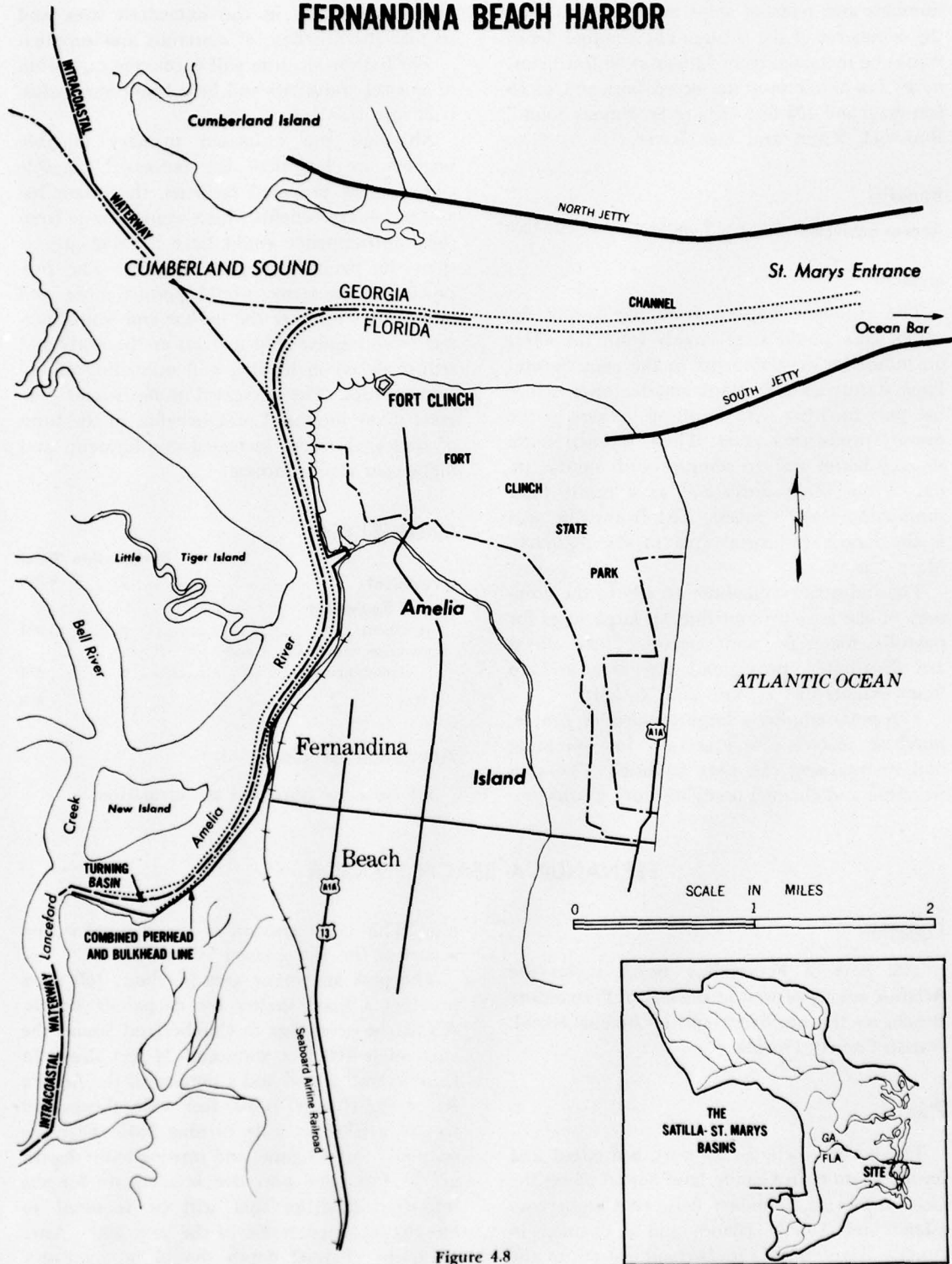


Figure 4.8

Data

A modernization of the wharves will be needed in the future to handle the cargoes of shrimp, fish, cellulose pulp paper boxes and probably petroleum products and specialized cargoes needed by the paper and chemical industries. The channel depth would be increased from 28 feet to 34 feet below mean low water.

Benefits

Annual Equivalent Primary Tangible \$375,000

Impacts

In 1959, the port commerce of Fernandina Beach was about 82 percent Intracoastal Waterway and 18 percent coastwise shipments. The projected deep-water traffic in the year 2000 is expected to increase to 27 percent of the total traffic. It will involve mostly fuel oil, sulfur, soda, and pulpwood. These products are either used or produced by businesses near the port. Inasmuch as the trend is toward deeper draft vessels, the channel must be deepened if all of the projected traffic is to be realized. The port traffic results in an overall savings in transportation for those industries who use it.

From a local viewpoint, these savings are reflected in increased payrolls and purchase of materials and services with a resulting betterment of the economic well being of the area. The port also employs local workers and contributes to the economy of the area.

Good harbor facilities will help provide an environment suitable for encouraging present businesses to remain and new businesses to come into the area. Failure to provide adequate port facilities will deter ships from stopping at the port with a resulting economic loss to the area.

Costs (\$1,000)

Investment	Early action	Total
Total	0	1,830
Annual Equivalent		
Investment	0	88
Operation, maintenance, and replacements	0	236
Total	0	324

Allocation of Costs

All costs are allocated to navigation.

UMBRELLA CREEK CHANNEL PROJECT

Location

Umbrella Creek is a small tidal stream located between the Little Satilla and Satilla Rivers and just south of Dover Bluff, Georgia. It flows into Jekyll Sound.

Plan

The plan for the Umbrella Creek project provides for dredging the shoals in the channel to its original depth and diversion works to divert flows through the restored channel for its maintenance in order that the channel might again be used for sport fishing and recreational craft.

Benefits

Recreation benefits would be realized by the residents of Dover Bluff. An increase to over

4,000 user-days annually of boating and sport fishing is expected.

Annual Equivalent Primary Tangible \$8,000

Impacts

The town of Dover Bluff has 46 properties which were established in this location because of their proximity to the Atlantic coast and good access to the coastal waters for boating and fishing. These properties have depreciated in value in recent years primarily because of deposition of mud in the once good navigable channel. Complete closure of the channel by silting would further depreciate these property values and increase the cost for restoring the channel.

Restoration of the channel to its original size and depth will restore the value of the property. It would also increase its use by recreation and fishing craft.

UMBRELLA CREEK CHANNEL

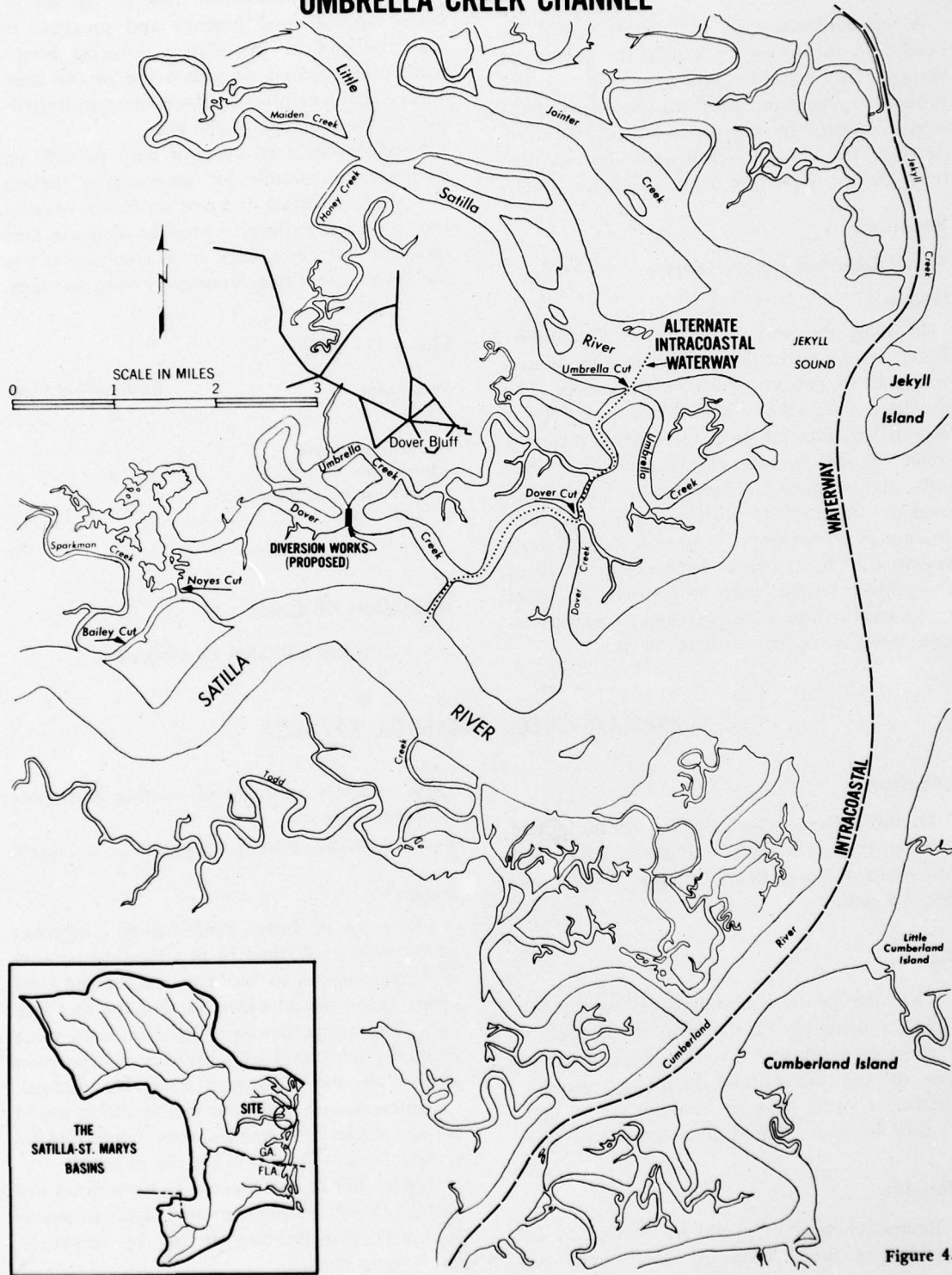


Figure 4.9

Costs (\$1,000)

Investment	Early action	Total
Total	150	150
Annual Equivalent		
Investment	5.4	5.4
Operation, maintenance, and replacements	0.6	0.6
Total	6.0	6.0

Allocation of Costs

All costs are allocated to navigation (recreation).

Special Considerations

Umbrella Creek, prior to 1900, followed a horseshoe-shaped course past the town of Dover Bluff with the open end of the horseshoe being separated by a narrow neck of land. It is reported that a wide sand beach existed at the bluff and adequate navigable depths were available for access to Jekyll Sound and the Atlantic Ocean. About 1900, a cut was made across the narrow neck of land which permitted the flow of the stream, and the ebb and flow of the tides, to bypass the loop of the stream above which Dover Bluff is located. It is not known whether the

cut was due to natural causes or manmade, however, a shoaling problem has been reported and did exist prior to the construction of the Intracoastal Waterway. Over a period of years, the cut continued to erode and enlarge which permitted more and more water to pass through this channel with reduction in the flow through the original channel past Dover Bluff. The channel to Dover Bluff has shoaled to the extent that navigation has become difficult for the smallest craft and it appears that deterioration may be expected to continue.

The main route of the Intracoastal Waterway passes through Jekyll Sound. An alternative route has been constructed which extends from the Little Satilla River through Umbrella Cut to Umbrella Creek, then through its north branch and Dover Cut to Dover Creek, then through a cut in a narrow neck of land to the Satilla River. The alternative route was completed in 1939. The several cuts and channel connections constructed by the Federal Government, all of which are within 1 to 5 miles of Dover Bluff, may have contributed to the shoaling problem in Umbrella Creek by changing the direction and intensity of tidal flows, but conclusive evidence is lacking.

RECLAMATION, IRRIGATION, AND DRAINAGE

Location

The reclamation, irrigation, and drainage programs would be carried out on irrigable areas of the basins used for cropland and on wetland areas of the basins used for cropland and pastureland. Drainage of woodland is discussed under Forest Conservation and Utilization.

Plan

Summarized below are only those parts of the reclamation, irrigation, and drainage programs not included elsewhere in this Section. The irrigation provided by the Big Satilla Creek, Axson, and Broxton Creek reservoirs and the drainage provided by the upstream watershed projects are shown in the discussion of these projects.

The features of the plan are the irrigation by the year 2000, of an estimated 33,200 acres more of cropland than were irrigated in 1960. This irrigation program would be carried on by individual systems on an individual farm basis. Irrigation of home gardens, nurseries, lawn, pasture and nonagricultural areas would be in addition to the areas included in the plan. Governmental agencies, State institutions, and private concerns are expected to continue to provide technical and financial assistance, research, and education programs. About 55 percent of the water supply requirements are expected to be provided from farm ponds and 45 percent from individual wells and streams.

High value crops, such as tobacco and cotton, represent about 87 percent of the net returns from the irrigated acreage included in the plan. The acreages included in the plan have been

projected with the knowledge of the current limitations imposed by ownership patterns and land use, institutional factors such as crop allotments, and the expected time lapse before cropland uses are determined more nearly by competitive economic conditions even though the favorable returns-to-cost relationships may indicate a more extensive use of irrigation.

Poor drainage conditions on existing wetlands restrict the use on considerable areas of land in the Satilla-St. Marys basins. There is an estimated 144,400 acres of cropland, pasture, and range that could receive drainage treatment and are feasible to drain. Supplemental to the adequately drained existing areas, it is estimated an additional 19,700 acres of cropland and pastureland are expected to be drained by individual landowners from 1960 to 2000.

Surface facilities or open drains will be installed in most instances, but in the upper reaches of the basins, tile or closed drains may be installed. Individual farmers are expected to carry out nearly all the needed drainage improvements by using the detailed planning and technical assistance provided by Federal agencies through soil conservation districts. Cost-sharing assistance, research and education facilities would be continued under existing programs.

Nearly three-fourths of the net returns from drainage shown for the individually drained acreage in the plan are from tobacco to be grown on approximately 35 percent of the drained acreage. The acreages used in the plan for tobacco and other crops were projected with the knowledge of the current limitations imposed by ownership patterns and land use, institutional factors such as crop allotments, and the expected lapse in time before land uses are determined largely by competitive economic conditions even though the favorable returns-to-cost relationships may indicate that more extensive drainage would be warranted.

Benefits

Annual Returns to Farmers (\$1,000)

	Georgia	Florida	Total
Irrigation	1,772	196	1,968
Drainage	520	60	580
Total	2,292	256	2,548

Impacts

Irrigation provides insurance against drought conditions in some years, assists in prompt germination and continuous plant growth, the survival of transplanted material, and the maturing of crops, helps in establishing vegetative cover on eroded areas, and provides for better use of land in accordance with capability. Drainage also provides for better use of land in accordance with its capability, and also provides for improved land preparation, seeding, cultivation, management, and harvesting.

Reclamation, irrigation, and drainage impacts are discussed in more detail in Section III, Impacts of the Plan, of this Part.

Costs (exclusive of technical assistance) (\$1,000)

Investment	Georgia	Florida	Total
Early action			
Irrigation	1,520	208	1,728
Drainage	96	14	110
Total	1,616	222	1,838
Total			
Irrigation	4,247	533	4,780
Drainage	223	33	256
Total	4,470	566	5,036

Annual Equivalent

Irrigation			
Investment	153.0	19.0	172.0
Operation, maintenance, and replacements	776.0	97.0	*873.0
Total	929.0	116.0	1,045.0
Drainage			
Investment	8.1	1.2	9.3
Operation, maintenance, and replacements	17.2	2.5	*19.7
Total	25.3	3.7	29.0
Irrigation and drainage			
Investment	161.1	20.2	181.3
Operation, maintenance, and replacements	793.2	99.5	*892.7
Total	954.3	119.7	1,074.0

*Operation, maintenance, and replacements costs by year 2000 are assumed to be equal to the annual equivalent operation, maintenance, and replacements costs.

Allocation of Costs

All costs are allocated to irrigation and drainage.

HYDROELECTRIC POWER AND INDUSTRIAL DEVELOPMENT

The total electric power requirements in the Satilla-St. Marys basins are projected to be about 5.4 billion kilowatt-hours with a demand of about 1.0 million kilowatts by the year 2000. There are no hydroelectric powerplants operating within the basins. Increases in electrical load will be met by constructing additional thermal-electric powerplants in the basins and nearby areas.

There is a need for hydroelectric powerplants to provide peaking capacity, particularly in the northern Florida portions of the basins. Here, during the months of December, January, and February, large peak loads are required for heating purposes. The Macclenny dam and reservoir site has the potential for developing peak power. This project may become feasible as the need for peaking power increases.

Industrial development activities as related to the projections of population, employment, income, and agricultural production are expected to expand in those areas concerned with pulp and paper products, processing agriculture products, *chemical processing*, and the apparel industries. The Brunswick metropolitan area has an excellent potential for industrial expansion.

Large tracts of undeveloped lands adjacent to the Intracoastal Waterway offer potential sites for industry whose products would be needed for jet engines and rockets. Such products would have protected waterway transportation, at low costs, to Cape Canaveral. The area has available labor, low tax rates, good weather, and transportation facilities.

Among the more important industry categories in the Satilla-St. Marys basins are pulp and paper and lumber and wood products. With 79 percent of the total land area in forests, this resource has long been an important item in the basins economy. Food processing is also of much significance, due to the seafood processing and poultry processing industries in the basins. All three of these industry segments will increase in employment. Also increasing significantly will be apparels and chemicals. By 2000, the number of people employed in manufacturing is projected to increase two and one-half times the 1960 number while agricultural

employment is expected to continue to decline.

Expansion in industrial development in the basins depends on many factors: Raw materials, markets, labor, power, and transportation are among the most important ones. Others are climate, taxes, governmental cooperation, land availability, financing, community facilities, and community attitude. When all factors are considered and balanced, community attitude is possibly the most important deciding factor.

Community attitude is best expressed through local organization for industrial development. Types of local organizations include: Chambers of commerce, county development authorities, development committees, and development corporations. The success of any organization depends upon the resourcefulness, energy, goals, enthusiasm, attitudes, tools, leadership, and judgment of the people in the organization.

Assistance is available from many sources in solving problems of economic development including private consultants, universities, and many State and Federal agencies.

The Small Business Administration can lend 80 percent of the cost of establishing new industries up to a maximum of \$250,000 for each individual project. Under the Small Business Investment Act, loans can be made to local development companies to finance the construction, conversion or expansion of industrial plants, and shipping centers for ownership or tenancy by small business concerns. These loans are made for 10 years at an interest rate of 5½ percent or lower and are repaid through receipts from lease of the buildings. The local agency is required to provide 20 cents of every dollar spent on the project.

The Area Redevelopment Act of 1961 is directed toward creating needed new employment opportunities through the development of facilities and resources. The program offers five broad types of assistance: Loans for industrial and commercial projects, loans and grants for public facilities, technical assistance, occupational training, and retraining subsistence payments. Many Federal and State agencies cooperate under the provisions of the Act. Also, the University of Georgia, Georgia Institute of Tech-

nology, and the University of Florida will provide technical assistance to eligible areas.

A forerunner of the Area Redevelopment Act was the Rural Development Program established in 1955. Now renamed the Rural Areas Development Program, this program is an inter-agency effort to solve some of the economic problems of rural underdeveloped areas. The U. S. Department of Agriculture and the land-grant colleges are very active in this work. The University of Georgia has recently organized the Institute of Community and Area Development to coordinate work in this field. Coordination in Florida is effected through the Florida Development Commission, working closely with the Extension Service at the University of Florida.

Also, there is increased opportunity under the Federal Housing Act to rehabilitate blighted residential, industrial, and commercial areas and to obtain technical assistance and planning aid in cities, small towns, and counties.

Under provisions of the Job Training Act of 1962, trainable unemployed workers, members of farm families with a total income of less than \$1,200 a year, and youths between 16 and 22 will be trained in those skills found to be in short supply.

The focal point in obtaining and utilizing assistance under these programs rests with local groups organized to effectively delineate the community's interests and initiate action toward obtaining these objectives.

SOIL CONSERVATION AND UTILIZATION

Location

Soil conservation and utilization program would be carried out on the cropland, pastureland, and rangeland throughout the basins.

Plan

Soil conservation and utilization proposals for the Satilla-St. Marys basins are:

(1) Treatment of about 178,300 acres of cropland, pastureland, and rangeland by the installation of annual and enduring soil conservation measures and practices, which would include the establishment or reestablishment of vegetative cover, the improvement of vegetative cover, erosion control practices, management of grazing, and protection from fire.

(2) The installation of about 2,900 farm ponds from 1960 to the year 2000 for livestock water and to provide small impoundments fishing and recreation.

(3) The conversion of about 85,000 acres of woodland, pastureland, and other lands to cropland, and 98,000 acres of cropland, woodland, and other lands to pastureland.

Land owners and operators will install the

above measures on an individual farm basis and in upstream watershed projects with technical and financial assistance from private concerns and State and Federal programs.

Pressure is being applied to competitive land uses in the basins by expanding nonagricultural uses such as urban and industrial areas and highways. It is estimated that some 86,000 acres now used for agricultural production will be diverted to such nonagricultural uses by the year 2000 as well as large acreages in other parts of the country. The erosion control and water management problems on these lands will require similar treatment measures as for cropland and pastureland and will be applied by private individuals, industries, and local and State entities. At the time these areas move into non-agricultural use, the specific problems and solutions will need to be determined and means established to carry out the control measures.

Data

Land Use 2000

	Acre
Cropland and pastureland	465,000
Woodland	2,542,000
Other	420,000
Total	3,427,000

Benefits (\$1,000)**Annual Returns to Farmers**

	Georgia	Florida	Total
Total	738.4	182	920.4

Costs (exclusive of technical assistance) (\$1,000)

Investment	Georgia	Florida	Total
Early action	2,634	678	3,312
Total (1960-2000)	7,160	1,555	8,715

Annual Equivalent Total Program

	Georgia	Florida	Total
Investment	258.8	56.2	315.0
Operation, maintenance, and replacements	271.8	85.6	357.4
Total	530.6	141.8	672.4

Annual Operation, Maintenance, and Replacements at Year 2000

271.8	85.6	357.4
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Allocation of Costs

All costs are allocated to soil conservation and utilization.

FOREST CONSERVATION AND UTILIZATION**Location**

The proposed forest program would affect 6,000 acres of noncommercial and 2,710,000 acres of commercial forest land in the basins, including 52,000 acres in Federal ownership and 48,000 in public non-Federal ownership.

Plan

The forestry program would provide: (1) Technical assistance based on needs as shown

by periodic examination of woodlands; (2) timber-stand improvement, including the elimination of interior trees and thinning operations; (3) tree planting; (4) inspection for insect and disease infestations; (5) water management, by drainage and flood control; (6) fire protection, by providing additional towers, equipment, and personnel, increased air observation and fire breaks, including roads; (7) additional protection from uncontrolled grazing; (8) education and information; and (9) additional studies.

Data

Item	Unit	Georgia	Florida	Total
Fire protection (new and intensified)	acre	1,919,000	616,000	2,535,000
Protection from uncontrolled grazing	acre	218,000	67,000	285,000
Fencing	mile	500	150	650
Erosion control	acre	1,750	500	2,250
Water control	acre	304,000	325,000	629,000
Timber-stand improvement	acre	770,000	250,000	1,020,000
Tree planting and site preparation	acre	1,246,000	394,000	1,640,000

Annual production—2000

Timber cut (million)	cu. ft.	137	43	180
Gum-naval stores (thousand)	bbl.	243	77	320

Benefits**Annual Equivalent Primary Tangible (\$1,000)**

	Georgia	Florida	Total
Total	3,079	972	4,051

Costs (\$1,000)

Investment	Georgia	Florida	Total
Early action			
Fire protection	50	15	65

	Georgia	Florida	Total
Control of grazing	154	46	200
Erosion control	43	13	56
Water control and forest roads	6,743	2,057	8,800
Planting and site preparation	8,860	2,740	11,600
Timber-stand improvement	1,400	449	1,849
Total	17,250	5,320	22,570

Total

	Georgia	Florida	Total
Fire protection	50	15	65
Control of grazing	153	47	200
Erosion control	43	13	56
Water control and forest roads	6,741	2,059	8,800
Planting and site preparation	22,400	6,900	29,300
Timber-stand improvement	6,303	1,926	8,229
Total	35,690	10,960	46,650

Annual Equivalent

	Georgia	Florida	Total
Investment	843	266	1,109
Operation, maintenance, and replacements	669	211	880
Total	1,512	477	1,989

Annual Operation, Maintenance, and Replacements at Year 2000

Georgia	825	Florida	261	Total	1,086
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Allocation of Costs

All costs are allocated to forestry.

FISH AND WILDLIFE

Location

The fish and wildlife programs would exert an influence throughout the basins and on adjacent coastal waters.

Plan

In addition to the fish and wildlife facilities included in the multiple-purpose projects, the following programs would be undertaken.

The features of the wildlife program are: (1) Habitat improvement in existing wildlife management areas; (2) development of six new upland game management areas; (3) development of that area designated as the Satilla marshes primarily for waterfowl purposes; (4) development of two small impoundments with an area of about 1,000 acres in the coastal marshes and river flood plains for waterfowl purposes; (5) extensive development of wildlife habitat throughout the basins; and (6) the expansion of current activities in research, planning, education and information, and management and enforcement.

The features of sport fisheries program are: (1) Improvement of the existing streams; (2) renovation and more intensive management of the existing lakes and impoundments; (3) improvement of existing services and facilities for coastal fishermen including installation of artificial reefs and fishing piers, and (4) the expansion of current activities in research, planning, education and information, and management and enforcement.

The marine waters of the basins would be capable of producing several times the amount of game fish which will be needed to meet projected requirements provided the inshore waters are protected against pollution, landfills, dredging, and other activities which are detrimental to fish production and utilization. The salt-water sport fisheries program thus would emphasize those measures which would bring fish and fishermen together. This program would consist of the construction of: (1) Twenty-five submerged offshore fishing reefs; (2) six fishing piers; (3) jetties and breakwater structures equipped with walkways and handrails to promote safe use; and (4) navigational aids to guide sport fishermen to the most productive "drops" or reefs; and (5) the preparation and dissemination of maps and information concerning available facilities and fishing opportunity.

The commercial fisheries programs would consist of: (1) Expansion of existing operations; (2) restoration of the oyster fishery; (3) cultivation of shrimp, oysters, pompano, and other high quality food fishes under controlled conditions; and (4) acceleration and expansion of existing facilities and going programs with a view toward more efficient harvest, and methods of handling and processing the catch, new sources of supply, sound regulations and enforcement, and increasing demand for domestic products. This program would meet the needs for 17.4 million pounds of food fish and 74.0 million pounds of industrial fish by the year 2000.

Data

	Unit	Georgia	Florida	Total
Wildlife				
Improvement of existing facilities				
Federally administered lands	acre	5,000	48,000	53,000
State administered lands	acre	24,000	26,000	50,000
Development of new facilities				
Cary Wildlife Management Area (game)	acre	0	50,000	50,000
Kings Ferry Wildlife Management Area (game)	acre	0	57,000	57,000
Town Creek Wildlife Management Area (game)	acre	50,000	0	50,000
Surrency Wildlife Management Area (game)	acre	50,000	0	50,000
Brushy Creek Wildlife Management Area (game)	acre	50,000	0	50,000
Nahunta Wildlife Management Area (game)	acre	50,000	0	50,000
Satilla River marshes (waterfowl)	acre	4,000	0	4,000
Small impoundments (waterfowl)	acre	2,000	0	2,000
Extensive habitat improvement			Basinwide	
Supporting programs			Basinwide	

Fresh-Water Sport Fisheries

Improvements of				
Existing large impoundments	acre	2,000	0	2,000
Existing small impoundments	acre	2,000	0	2,000
Development of new waters				
Small impoundments	acre		1,000	1,000
Supporting programs			Basinwide	

Salt-Water Sport Fisheries

Improvement of existing facilities	location		Coastwide	
New separate facilities				
Submerged fishing reefs	reef	20	5	25
Fishing piers	pier	4	2	6
Supporting programs	location		Coastwide	

Annual Use (projected increase at 2000, over 1960)

Hunting	user-day	148,000	117,000	265,000
Fresh-water angling	user-day	230,000	82,000	*312,000
Salt-water angling	user-day	47,000	200,000	*247,000
Total		425,000	399,000	824,000

Commercial Fisheries

Expansion of operation				
Industrial fisheries	location		Coastwide	
Industrial fisheries, increased production (thousands)	lb.	0	40,000	40,000
Food fisheries	location		Coastwide	
Food fisheries, increased production (thousands)	lb.	5,570	2,387	7,957
Seafood culture				
Oysters	acre	1.1	0	1.1
Oysters, increased production	lb.	500,000	0	500,000
Shrimp	acre	500	340	840
Shrimp, increased production	lb.	400,000	272,000	672,000
Total increased production (thousands)	lb.	6,470	42,659	49,129
Supporting programs	location		Coastwide	

*Includes 126,000 user-days of fishing from water-access areas. Benefits and costs of water-access areas are not included here but are shown under Water Access Areas.

Benefits

Annual Equivalent Primary Tangible (\$1,000)

	Georgia	Florida	Total
Wildlife	260	205	465
Sport fisheries	356	517	873
Commercial fisheries	620	470	1,090
Total	1,236	1,192	2,428

Impacts

Provisions should be made to safeguard existing wildlife resources on the coastal islands as an integral part of the recreational developments planned for these areas.

Provisions should also be made to conserve waterfowl throughout the Satilla-St. Marys basins as this is a declining resource in the Southeast River Basins area. The proposed Satilla River National Wildlife Refuge is justified largely on the basis of intangible values.

Fish and wildlife impacts are discussed in more detail in Section III, Impacts of the Plan, of this Part.

Costs (\$1,000)

Investment	Georgia	Florida	Total
Early action			
Wildlife	1,525	0	1,525
Sport fisheries	360	530	890
Commercial fisheries	32	7	39
Total	1,917	537	2,454

	Georgia	Florida	Total
Total			
Wildlife	1,550	0	1,550
Sport fisheries	820	685	1,505
Commercial fisheries	170	45	215
Total	2,540	730	3,270

Annual Equivalent

Investment			
Wildlife	47	0	47
Sport fisheries	19	19	38
Commercial fisheries	3	1	4
Total	69	20	89

Operation, maintenance, and replacements			
Wildlife	290	151	441
Sport fisheries	215	91	306
Commercial fisheries	417	314	731
Total	922	556	1,478

Total			
Wildlife	337	151	488
Sport fisheries	234	110	344
Commercial fisheries	420	315	735
Total	991	576	1,567

Operation, Maintenance, and Replacements by Year 2000	1,372	912	2,284
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Allocation of Costs

All costs are allocated to fish and wildlife.

Special Considerations

Many oysterbeds now closed due to pollution could be restored for production when an adequate pollution abatement program is installed.

RECREATION

Location

The recreation developments are distributed throughout the basins.

Plan

Summarized below are only those parts of the recreation program not included elsewhere in this Section. For example, fish and wildlife programs summarize hunting and sports fishing; multiple-purpose projects include those parts of the recreation program which are accounted for at each project.

The developments in the plan consist of the installation of facilities for swimming, camping, picnicking, cultural activities, hiking and sight-

seeing, and the construction of access roads, parking areas, and water supply and sanitary facilities. These would be located in forested areas, along streams and coastal areas, and adjacent to reservoirs of all sizes. At certain places land would be acquired. In some cases, existing recreation facilities would be expanded and historical and botanical items preserved for use by the public. Some undeveloped areas would be developed.

The coastal region along the Atlantic Ocean has been and will probably continue to be the major opportunity for outdoor recreation in the Satilla-St. Marys basins and will afford an estimated 80 percent of the opportunities for recre-

ation. The beaches afford salt-water surf bathing resources which attract people from the Southeast, as well as from other areas in the United States.

There are 16 areas in the basins plan for development. Nine of these areas already have recreation facilities and two additional areas are in public ownership. The areas where the recreation facilities are to be expanded range from parks with high-density use to large general outdoor areas with low-density use.

There are five coastal islands, four of which would be developed to meet the needs of people for mass use, to accommodate a large number of visitors. The beaches are of high quality and some are located near the Jacksonville metropolitan area. A large part of the coast should be kept available for the public. The island areas where recreation facilities are proposed are: (1) Little Talbot Island State Park, Florida, (2) three parks on Amelia Island, Florida, consisting of Fort Clinch State Park, Fernandina Beach, and the south end of the island; (3) Jekyll Island, Georgia, an 11,000-acre island now operated by a State authority; and (4) Sea Island, Georgia, which is located near Brunswick.

Additional facilities for swimming, camping, picnicking, and boating could be installed at Crooked River and Laura S. Walker State Parks. Osceola National Forest, Cary State Forest, and Waycross State Forest offer opportunities for outdoor recreation and may be developed for a varied program of recreation.

Cumberland Island is in Camden County, Georgia, just off the mainland of the Atlantic coast between the mouths of the St. Marys and Nassau Rivers. The project would consist of public acquisition of the island and the development of the area in keeping with high standards for a recreation resource of this caliber. Access would be provided by the construction of highways and a bridge. Facilities for boating, camping, swimming, picnicking, sightseeing, and cult-

ural activities would be provided and service facilities for parking, water supply, sanitation, and administration would be constructed.

There are many historic sites, but not all are incorporated into the recreation program for development. The three historic sites included in the plan are Fort Frederica National Monument, St. Marys Town, and Tabby Sugar House Ruins.

Fort Frederica National Monument on St. Simons Island, Georgia, is the site of Oglethorpe's eighteenth century fortified town. The facilities at this 94-acre site would be expanded to meet a larger expected use.

St. Marys Town, Georgia, at the mouth of the Nassau River, has played an important role in the history of Georgia. It contains buildings and relics of historic importance. The program would consist of means of preserving structures of historic importance for public inspection and edification. Facilities would be provided for sightseeing, parking, water supply, sanitation, and interpretive centers.

Tabby Sugar House Ruins constructed in early colonial days, in Camden County, Georgia, is a few miles north of St. Marys Town. The project would consist of public acquisition of the ruins and 10 acres of land to establish a park for preservation of the ruins for inspection by the public.

Bartram's Ixia project would consist of public acquisition of 500 acres of land and establishment of a recreation area for the protection and propagation of Bartram's Ixia and other rare and unusual plants. The area should be preserved because of its botanical value.

Data

The proposed level of development at existing and new single-purpose recreation areas included in the plan would provide an opportunity for the following estimated use of facilities:

Developments

	User-days annually (1,000)		
	1960 Base	By 1975	By 2000
Existing Developments			
Little Talbot Island State Park, Florida	350	550	1,100
Fort Clinch State Park, Florida	300	600	1,000
Fernandina Beach, Florida	400	650	1,100
Jekyll Island Authority, Georgia	1,000	2,000	4,000
Sea and St. Simons Islands, Georgia	150	800	1,350
Crooked River State Park, Georgia	100	300	500
Laura S. Walker State Park, Georgia	50	120	250
Cary State Forest, Florida	---	150	300
Waycross State Forest, Georgia	---	50	150
Osceola National Forest, Florida	5	30	50
Fort Frederica National Monument, Georgia	150	250	400
Subtotal	2,505	5,500	10,200
New Developments			
Cumberland Island, Georgia	---	1,000	4,000
St. Marys Town, Georgia	---	100	220
Tabby Sugar House Ruins, Georgia	---	50	100
Bartram's Ixia, Florida	---	50	100
Amelia Island, Florida	---	1,000	2,000
Subtotal	---	2,200	6,420
Total	2,505	7,700	16,620



Figure 4.10 Bartram's Ixia is a rare plant growing primarily in one small area in Baker County near the village of Manning, Florida. This area is believed to contain the last extensive stand of this variety of Ixia.

Benefits

Annual Equivalent Primary Tangible (\$1,000)

	Georgia	Florida	Total
Total	11,400	4,780	16,180

Costs (\$1,000)

Investment

Early action	25,160	6,760	31,920
Total	44,230	14,710	58,940

Annual Equivalent

	Georgia	Florida	Total
Investment	1,269	425	1,694
Operation, maintenance, and replacements	1,598	606	2,204
Total	2,867	1,031	3,898

Operation, Maintenance, and Replacements at Year 2000

2,387	1,073	3,460
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Allocation of Costs

All costs are allocated to recreation.

POLLUTION ABATEMENT AND PUBLIC HEALTH

Location

The pollution abatement and public health programs would be basinwide.

Plan

In addition to low-flow augmentation for the dilution of wastes provided by the water-storage projects, which are not discussed here, the program for pollution abatement consists of new and extended sewerage systems and new and enlarged municipal and industrial waste-treatment facilities.

The public health program includes drainage and spraying measures for vector control, collection and disposal of solid waste for fly and rodent control, air pollution and radiological monitoring.

Data

Pollution Abatement (to year 2000)

New and extended sewerage systems needed	30
Primary plants required	3
Secondary plants required	7
Stabilization ponds required	17
Sewer extensions required	27

Public Health (to year 2000)

Solid-waste collection and disposal Number of sanitary landfill operations required	24
Number of incinerators required	1
Vector control	Basinwide
Air pollution and radiological monitoring	Basinwide

Benefits

Annual Equivalent Primary Tangible

Benefits were considered to be at least equal to the costs, but project justification was largely on the basis of intangibles. Each proposal was evaluated to determine that there was no more economical alternative.

Costs

For vector control and air pollution and radiological monitoring, the plan assumes that investment costs incurred are a part of the annual equivalent costs. The investment in the land and equipment required for collection and disposal of solid wastes and for landfill operation are accounted for only in annual equivalent costs. Annual costs shown are those considered necessary to carry out effective basinwide programs.

Investment (\$1,000)	Georgia	Florida	Total
Early action			
Pollution abatement			
Municipal	6,361	2,317	8,678
Industrial	507	125	632
Subtotal	6,868	2,442	9,310
Public health			
Solid waste (incinerator)	400	---	400
Vector control	---	---	---
Air pollution and radiological monitoring	---	---	---
Total	7,268	2,442	9,710

Total	Georgia	Florida	Total
Pollution abatement			
Municipal	16,154	3,741	19,895
Industrial	206	799	1,005
Subtotal	16,360	4,540	20,900
Public health			
Solid waste			
(incinerator)	400	---	400
Vector control	---	---	---
Air pollution and radiological monitoring	---	---	---
Total	16,760	4,540	21,300
Annual Equivalent (\$1,000)			
Investment	395	100	495
Operation, maintenance, and replacements	544	143	687
Total	939	243	1,182
Operation, Maintenance, and Replacements (\$1,000)			
Pollution abatement			
Municipal	114	35	149
Industrial	26	11	37
Subtotal	140	46	186
Public health			
Solid waste	212	58	270
Vector control	186	35	221
Air pollution and radiological monitoring	6	4	10
Subtotal	404	97	501
Total	544	143	687

Summary of Costs (\$1,000)

	Investment	Total annual equivalent	OM&R at year 2000
Georgia			
Pollution abatement			
Municipal	16,154	481	196
Industrial	206	46	45
Subtotal	16,360	527	241
Public health			
Solid waste	400	220	347
Vector control	0	186	186
Air pollution and radiological monitoring	0	6	6
Subtotal	400	412	539
Florida			
Pollution abatement			
Municipal	3,741	130	60
Industrial	799	16	19
Subtotal	4,540	146	79
Public health			
Solid waste	0	58	88
Vector control	0	35	35
Air pollution and radiological monitoring	0	4	4
Subtotal	0	97	127
Total	21,300	1,182	986

Allocation of Costs

All costs are allocated to pollution abatement and public health.

BEACH EROSION CONTROL AND HURRICANE PROTECTION

Location

Areas considered include the islands of St. Simons, Jekyll, Cumberland, Amelia, and Talbot.

Plan

The plan for the Satilla-St. Marys basins includes a cooperative survey to develop needs and solutions for beach erosion control and hurricane protection. The survey would consider influences of tides, offshore currents, hazards from hurricanes, winds, and places of immediate danger. In this connection, use should be made of the results of Corps of Engineers studies which cover most of the hurricane-protection problems in the study area.

The existing hurricane warning system should

be modified as required to serve the area better. Evacuation routes should be established over bridges and causeways and a plan for using existing ferry and other boats for emergencies should be prepared for use on Cumberland Island and out-of-the-way places on other islands.

Provisions should be made and adopted for establishing and enforcing building codes, the construction of auxiliary power supplies, protective seawalls, and similar structures.

St. Simons and Amelia Islands have critical erosion problems. The Corps of Engineers has studied these areas and the Geological Survey has obtained basic erosion data. However, studies should be updated.

An official State agency in Georgia for shore

preservation should be established with necessary provisions for State participation in erosion studies and in construction of protective works. The similar State agency now in Florida should be utilized to the utmost.

SECTION VI - OTHER PROJECTS CONSIDERED

This Section presents some of the alternative projects and programs considered in the plan formulation process but which are not included in the comprehensive plan. Appendix 12, Planning, includes more detail on the factors involved in decisions to include or not include projects and program features in the basins plan.

Dams and Reservoirs

A few potential dam and reservoir sites have been studied previously in the Satilla-St. Marys basins, but no projects have been found economically justified. Published data on these sites and many other potential sites were considered and the 24 sites indicated on map, Dams and Reservoirs considered, Figure 4.11, were studied. The locations of the sites were determined by an examination of prior reports, existing maps, and by field reconnaissances of the basins area. Of the 24 sites studied, 5 are included in the plan for the Satilla-St. Marys basins.

The Macclenny site was considered in several ways for multiple-purpose uses involving the purposes of fish and wildlife, recreation, and hydroelectric power generation. The elevation of the reservoir normal full pool was limited to an upper elevation of 105 feet because a pool higher than this elevation would extend into the Okefenokee Swamp and thereby might seriously affect this wildlife refuge. The studies showed that at reservoir full pool elevation 105 the benefits from hydroelectric power would little more than offset the cost for the power facilities and that the project would have a capacity far greater than the projected needs for recreation and fish and wildlife. This proposal could, therefore, not be justified.

The development of hydroelectric power could not be justified in combination with recreation and fish and wildlife at the Macclenny site with reservoir normal pool elevations of 100

The beach erosion plans developed should be coordinated with plans for channel improvements and maintenance, hurricane protection, recreation and fish and wildlife proposals, and other proposed improvements in the area.

feet and 80 feet, respectively. The fish and wildlife and recreation benefits, which would accrue from these proposals, could be obtained at less cost by alternative means. A multiple-purpose project at the Macclenny site has not, therefore, been included in the basins comprehensive plan.

The more significant sites studied, except those in the plan, and a brief statement on location, description, purposes considered, and reason for not including them in the plan are shown in the summary that follows.

Other Features

Studies were made of the need for commercial navigational development on the lower reaches of the Satilla and St. Marys Rivers based on an analysis of previous reports and a study of commodity movements within the basins. These studies showed that the traffic could be moved more economically by trucks and trains than by water.

Studies were also made of the possibility of canalizing the Satilla River to Waycross, Georgia, for barge traffic use. This project was not economically justified.

The possibility of developing a canal connecting the St. Marys and Suwannee Rivers for barge traffic between the Atlantic and Gulf coasts was studied. It was determined that the costs would far exceed the benefits from such a project.

Consideration was also given to the possibility of diverting streamflow from the Suwannee River to St. Marys River primarily for the development of hydroelectric power. This proposal was found not economically feasible under currently projected conditions.

Preliminary studies were made of the possibility of developing surface water supplies for Douglas, Georgia. These studies showed that ground water supplies could be developed much cheaper than surface water supplies.

Name of project not included in plan	Key number on Figure 4.11	Location	Description	Purpose	Reason for not including in plan
Burnt Fork.....	1	On Satilla River, 10 miles NE. of Folkston, Ga.	Dam, reservoir, and powerplant	P,R,F&W	Not economically justified
Hurricane Creek...	2	On Alabaha River, 10 miles S. of Hazlehurst, Ga.	Dam, reservoir, and powerplant	P,R,F&W	Not economically justified
Waycross.....	3	On Satilla River, 10 miles N. of Waycross, Ga.	Dam, reservoir, and powerplant	P,R,F&W,PA	Not economically justified
Pearson.....	4	On Satilla River, 7 miles NE. of Pearson, Ga.	Dam, reservoir, and powerplant	P,R,F&W	Axson reservoir better alternative
Satilla-St. Marys Project.....	5	On Satilla and St. Marys Rivers, 6 miles NE. of Folkston, Ga.	Dam, reservoir, and powerplant	P,R,F&W	Not economically justified
Macclenny.....	6	On St. Marys River, 5 miles N. of Macclenny, Fla.	Dam and reservoir	R,P,F&W	Not economically justified
Little Hurricane Creek.....	7	On Little Hurricane Creek, 7 miles S. of Alma, Ga.	Dam and reservoir	F&W,R	Upper Hurricane site better alternative
Alabaha River....	8	On Alabaha River in Pierce County, Ga.	Dam and reservoir	R,F&W	Topography unfavorable for dam and reservoir development
Little Satilla Creek.....	11	On Little Satilla Creek, 7 miles SW. of Jesup, Ga.	Dam and reservoir	R,F&W	Big Satilla Creek site better alternative
Spanish Creek Lower.....	12	3 miles W. of Folkston, Ga.	Dam and reservoir	F&W,R	Needs satisfied more economically by existing streams and coast
Spanish Creek Bethel Church...	13	4 miles NW. of Folkston, Ga.	Dam and reservoir	F&W,R	Needs satisfied more economically by existing streams and coast
Mays Bluff Branch.....	14	On Mays Bluff Branch in Charlton County, Ga.	Dam and reservoir	F&W,R	Needs satisfied more economically by existing streams and coast
Buffalo Creek....	15	In Pierce County, Ga.	Dam and reservoir	F&W,R	Needs satisfied more economically by existing streams and coast
Little Buffalo Creek.....	16	In Pierce County, Ga.	Dam and reservoir	F&W,R	Needs satisfied more economically by existing streams and coast
St. George.....	18	On St. Marys River, 2 miles SW. of St. George, Ga.	Dam and reservoir to be used as after-bay for Macclenny	P,R,F&W	Not economically justified
Douglas.....	19	On Satilla River, 5 miles SW. of Douglas, Ga.	Dam and reservoir	F&W,R,PA	Axson site better alternative
Seventeen Mile Creek.....	21	5 miles E. of Douglas, Ga.	Dam and reservoir	F&W,R,PA	Axson site better alternative
Thomas Creek....	22	On Thomas Creek, a tributary of Nassau River	Dam and reservoir	F&W	Nassau River Embayment site better alternative
Upper Thomas Creek.....	23	On Thomas Creek, a tributary of Nassau River	Dam and reservoir	F&W,R	Nassau River Embayment site better alternative

DAMS AND RESERVOIRS CONSIDERED

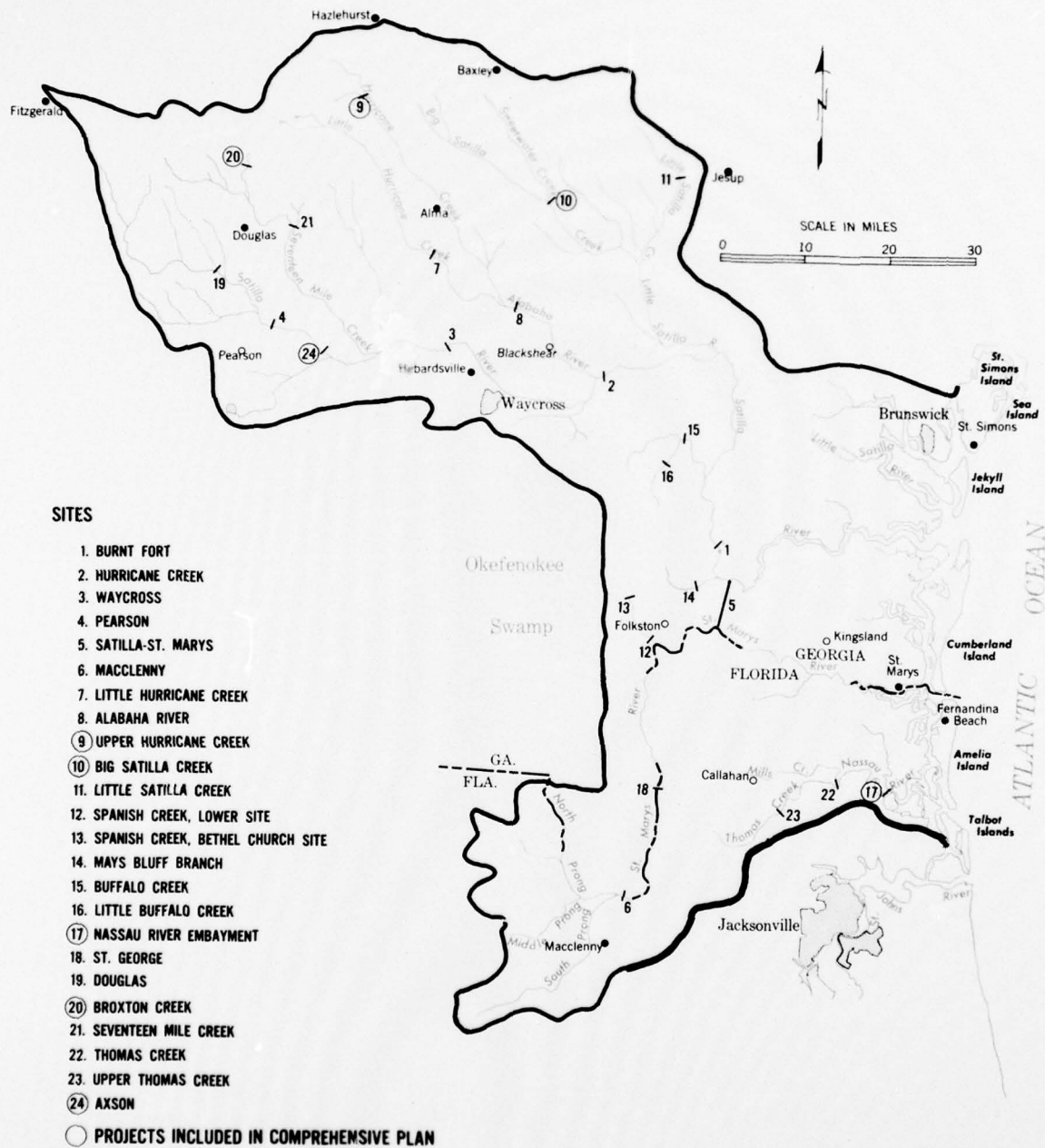


Figure 4. 11

PART FIVE - CONCLUSIONS

DISCUSSION

The Satilla-St. Marys basins have the potential for continued population and personal income growth through the year 2000. The population in 1960 is expected nearly to double by 2000. In 1960, about half of the population was urban, and it is expected that the urban population will increase to about 80 percent by 2000. The per capita income of \$1,378 in 1960 is expected to more than double by 2000. This increase is estimated to come about primarily through increased employment in the manufacturing field and the related trades and services.

Urbanization, with the corresponding increase in manufacturing productivity and trades and services will be particularly significant in the Brunswick area and in the larger urban centers of Waycross, Douglas, and Baxley in Georgia and Fernandina Beach, Florida. Realization of the projected levels of population, employment, and income depend on a continued rise in productivity of the area and its workers. This will require skilled employees and people with a good educational background. It is, therefore, important that the education levels be raised and that other institutional adjustments be made if increased productivity and desirable shifts of employment are to be realized.

Many of the people of the Satilla-St. Marys basins are aware of their problems and are making efforts in the direction of planning and education. The areas have the potential resources necessary for its development.

The topography, soils, and climate of the basins are favorable for expanding agricultural pursuits. Also, the forests, swamps, streams, sea-shore, and islands of these basins present many opportunities for selective development and protection for fishing, hunting, and recreation by

future generations. The extensive forests provide a large amount of raw material for wood-using industries and gum-naval stores products. The large quantities of surface and ground water provide favorable circumstances for industry, irrigation, and streamflow regulation for fish and wildlife, recreation, pollution abatement, and water supply. The good ocean ports and navigable channels near the ocean offer opportunities for increased commercial and recreational traffic. The desirable climate and physical characteristics of the basins, ample areas of level land, high quality water, available labor, and local interest indicate the probability of locating many new industries to broaden the economic base of the basins.

Lands along the coast and near the Intracoastal Waterway could be developed for industrial sites for the production of missile engines and other missile appurtenances. The area is attractive because of the availability of labor, low tax rates, good weather, reasonable real-estate costs, closeness to deep-water ports, and the availability of water transportation via the Intracoastal Waterway to the Cape Canaveral, Florida, missile launching area.

The comprehensive plan for the Satilla-St. Marys basins is formulated to meet needs to the year 2000 using the land and water resources in the most efficient manner and in relation to the needs of the basins, the Southeast, and the Nation. Implementation of the plan will meet those needs and develop and utilize the resources to the extent necessary to provide the people of the basins with adequate employment opportunities and the means of obtaining a suitable standard of living.

CONCLUSIONS

The Commission concludes that:

(1) Development of the land and water resources of the Satilla-St. Marys basins to meet

the needs to the year 2000 will require coordinated non-Federal and Federal endeavor. Opportunities for expanding resources development

to meet much greater needs will exist beyond the year 2000.

(2) The agricultural lands of the area, with the presently known management and technology, are more than adequate to produce the basins share of the national needs for food and fiber through the year 2000.

(3) The sources of ground and surface waters of the basins are also more than adequate to meet the foreseeable needs provided the quality is not impaired by pollution.

(4) The program for domestic, municipal, and industrial water supplies will meet the needs to the year 2000. The availability of an abundance of good water will assist in the economic and industrial development of the area.

(5) Improvement of the main reaches of the Satilla and St. Marys Rivers for flood control is not warranted at this time due to the lack of sizeable flood damageable developments in the overflow areas. Proper flood plain management and zoning would control further development in the overflow areas and prevent damages in the future. The proposed upstream watershed projects will provide flood control and prevention and drainage on the bottom lands in watersheds totalling 1.2 million acres of land.

(6) Much land in the area is suitable for increasing productivity by drainage and irrigation, but the actual amounts will be limited by economics and financing. Individual farmers are expected to irrigate about 33,000 acres more of cropland by the year 2000 than was irrigated in 1960 and drain about 20,000 additional acres of cropland and pastureland by the year 2000.

(7) No developments for generating hydroelectric power are included in the plan. The power needs of the basins will continue to be met by thermal plants inside and outside the basins.

(8) Industrial development will increase in the Satilla-St. Marys basins and will be enhanced by execution of the comprehensive plan of development.

(9) Annual and enduring soil conservation and utilization measures are necessary to conserve the basic land resource and to improve the per capita income and standard of living of the farmers. The plan provides for treatment of

an additional 178,300 acres of cropland, pastureland, and rangeland by the year 2000.

(10) The program for forest conservation and utilization will include over 2.5 million acres of woodland in the basins by the year 2000 which will meet the projected timber production needs of two and one-half times the timber production in 1960.

(11) The land and waters in the Satilla-St. Marys basins are well adapted to the production of many varieties of fish and wildlife. Facilities included in the plan will meet the projected needs to the year 2000 with some adjustments in the sportman's choice as to types of hunting and fishing.

(12) The outdoor recreation plan provides for the projected need of 20 million user-days of recreation annually by 2000, which is eight times the estimated user-days of recreation in 1960, and will be a principal means of bringing outside money into the basins.

(13) Salinity and sediment are not major problems in the Satilla-St. Marys basins. Salt-water intrusion in the ground water aquifer can become a problem in the Brunswick and St. Marys, Georgia, and Fernandina Beach, Florida, areas with excessive localized pumping. Judicious withdrawal of water and further study are required.

(14) The pollution abatement and public health program will contribute to the general health and welfare of the residents and visiting tourists and recreationists.

(15) The proposed Nassau River Embayment is a research and experimental project for the development of a practical means of utilizing large areas of undeveloped saline marshes along the Atlantic and Gulf coasts for fish and wildlife, recreation, and other purposes. This project is expected to furnish data which will be useful in the development of similar areas in the southeastern part of the United States.

(16) Early development of the Big Satilla Creek project will demonstrate the feasibility of this type of project in a rural underdeveloped area and provide a means of identifying the benefits produced by it and associating these benefits with the local beneficiaries' ability to repay a share of the project costs.

(17) The large releases of water from the

proposed Axson reservoir for low-flow augmentation will improve the water quality in the Satilla River making it more suitable for economic development of the area.

(18) Development of the plan can be scheduled to meet the needs as they grow from year to year. At the present time, Federal, State, and local and private expenditures for resource development in the Satilla-St. Marys basins represent about 4 percent of the basins total personal income. If the current proportion of personal income continues to be invested in resources to the year 2000, such funds would be adequate to accomplish the plan, although the timing of availability of the funds may create temporary problems.

(19) Basic data available for the Satilla-St. Marys basins for resources planning are meager. Additional topographic and geologic mapping, hydrologic and economic data, and analysis of existing information are necessary for implementation of the plan.

(20) The projects and programs described in Part Four provide a basic, comprehensive, and integrated plan of development of the land and water resources of the basins. These developments, with the adjustments and revisions growing out of more detailed studies, should assist greatly in obtaining maximum public benefits for the region and the Nation, consistent with the objectives and criteria of the study.

PART SIX - LOCAL, STATE, AND FEDERAL PARTICIPATION AND ASSISTANCE

Acknowledgements

The U. S. Study Commission, Southeast River Basins, gratefully acknowledges the assistance and cooperation of the following:

Alabama

Department of Agriculture; Auburn University; Department of Conservation; State Docks Department; Extension Service; Division of Forestry; Geological Survey; Department of Public Health; Highway Department; State Planning and Industrial Development Board; Department of Labor; Pilotage Commission; Public Service Commission; River Development Board; Soil Conservation Committee; Soil Conservation Districts; and Water Improvement Commission.

Florida

Department of Agriculture; Board of Conservation; Development Commission; Extension Service; Florida State University; University of Florida; Forest Service; Game and Fresh Water Fish Commission; State Board of Health; Industrial Commission; Inland Navigation District; Board of State Parks and Historical Monuments; Railroad and Public Utilities Commission; Road Department; Soil Conservation Board; Soil Conservation Districts; and Suwannee River Water Conservation Authority.

Georgia

Department of Agriculture; Bainbridge Port Authority; Brunswick Port Authority; Extension Service; Forestry Commission; Game and Fish Commission; University of Georgia; Georgia Institute of Technology; Georgia State College; Georgia Southern College; Department of Public Health; Highway Department; Department of Industry and Trade; Jekyll Island State Park Authority; Department of Labor; Department of Mines, Mining, and Geology; Department of State Parks; Georgia Ports Authority; Public Service Commission; Savannah District Authority; Soil and Water Conservation Committee;

Soil and Water Conservation Districts; Tidewater Commission; Waterways Commission; Water Quality Council; and Water Resources Commission.

North Carolina

Extension Service; State Board of Conservation and Development; Highway Department; North Carolina State College; Western North Carolina Regional Planning Commission; Soil Conservation Committee; Department of Water Resources; Soil Conservation Districts; and Wildlife Resources Commission.

South Carolina

Department of Agriculture; Clemson College; Development Board; Extension Service; Forestry Commission; State Board of Health; Department of Labor; Congaree Navigational Study Committee; Parks Commission; Ports Authority; Public Service Authority; Public Service Commission; Soil Conservation Committee; Committee for Water Development; Soil Conservation Districts; Water Pollution Control Authority; and Wildlife Resources Department.

General

Altamaha Development Association; Middle Chattahoochee Development Association; Upper Chattahoochee Development Association; Choc-tawhatchee-Pea Development Association; Council of State Governments; Southern Regional Education Board; Southeastern Power Committee of Electric Membership Cooperatives of Nine Southeastern States; and Three Rivers Development Association.

Federal

U. S. Department of Agriculture—Agricultural Marketing Service, Agricultural Research Service, Agricultural Stabilization and Conservation Service, Economic Research Service, Farmers Home Administration, Forest Service, and Soil Conservation Service; U. S. Department of the

Army—Beach Erosion Board, Board of Engineers for Rivers and Harbors, Corps of Engineers, and Military Posts; Atomic Energy Commission; Atlanta Federal Reserve Bank; U. S. Civil Service Commission; U. S. Department of Commerce—Area Redevelopment Administration, Business and Defense Services Administration, Bureau of the Census, Office of Business Economics, Bureau of Public Roads, Small Business Administration, and Weather Bureau; Federal Power Commission; General Services Administration; U. S. Department of Health, Education, and Welfare—Public Health Service; Housing and Home Finance Agency; U. S. Department of the Interior—Bureau of Commercial Fisheries, Geological Survey, Bureau of Mines, National Park Service, Bureau of Reclamation, Bureau of Outdoor Recreation, Southeastern Power Administration, and Bureau of Sport Fisheries and Wildlife; U. S. Department of Labor—Bureau of Labor Statistics; U. S. Department of the Navy—Sixth Marine Corps Reserve and Recruitment District; Executive Office of the President—Bureau of the Budget, and Public Works Planning; Outdoor Recreation Resources Review Commission; Advisory Commission on Intergovernmental Relations; Select Committee on National Water Resources, U. S. Senate, 86th Congress; Smithsonian Institution; U. S. Study Commission—Texas; and Tennessee Valley Authority.

In addition, the Commission gratefully acknowledges assistance received from numerous county and municipal governments, planning commissions, development commissions, chambers of commerce, corporations, trade associations, interested individuals, press, radio, television, and professional societies.

Public Hearings and Presentations

A series of public hearings were held early in the investigation to secure the views and desires of various interests, organizations, and individuals. These hearings were held at Tallahassee, Florida, on November 16, 1959; at Dothan, Alabama, on November 17, 1959; at Macon, Georgia, on November 18, 1959; and at Ander-

son, South Carolina, on November 19, 1959.

During the latter stage of the studies, a series of public presentations were held to acquaint the public with the proposed plan of the Commission for development of the land and water resources of the Southeast River Basins; to inform Federal, State, local, and private interests of their responsibility in implementing the developments proposed; and to solicit views and opinions on the proposals under active consideration. These presentations were held as follows:

Place	Date
Statesboro, Georgia	March 20, 1962
Waycross, Georgia	March 23, 1962
Tallahassee, Florida	May 15, 1962
White Springs, Florida	May 17, 1962
Valdosta, Georgia	May 18, 1962
Geneva, Alabama	June 19, 1962
Pensacola, Florida	June 20, 1962
Savannah, Georgia	July 16, 1962
Clemson, South Carolina	July 17, 1962
Atlanta, Georgia	August 13, 1962
Columbus, Georgia	August 14, 1962
Albany, Georgia	August 14, 1962
Baxley, Georgia	August 15, 1962
Macon, Georgia	August 16, 1962
Athens, Georgia	August 17, 1962

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1.24	Georgia Forestry Commission
1.29	City of Waycross, Georgia
2.1	Soil Conservation Service
2.9	Soil Conservation Service
2.16	Georgia Forestry Commission
2.17	Georgia Forestry Commission
2.19	U. S. Forest Service
2.24	Florida State News Bureau
2.28	City of Waycross, Georgia
4.10	Albert A. Will, Jr., Fort Lauderdale, Florida
All other	U. S. Study Commission Staff